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Region 8 Methodology for Identifying Priority Resources of Concern to Guide Management on National Wildlife Refuges: Version 2

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Contents

Introduction

Selecting priority natural resources as a focus for management and monitoring is central to the development of refuge management plans. Focusing on priority resources ensures the efficient use of limited conservation dollars and improves the effectiveness of conservation delivery. U.S. Fish and Wildlife Service (USFWS) Habitat Management Plan policy (620 FW 1; link here) requires that a Habitat Management Plan (HMP) be developed for each National Wildlife Refuge. A HMP is a step-down management plan of the refuge Comprehensive Conservation Plan (CCP). HMPs are dynamic working documents that provide refuge managers with a decision making process, guidance for the management of refuge habitat and long-term vision, continuity, and consistency for habitat management on refuge lands. In Region 8, the I&M Program (I&M) is using the Open Standards for the Practice of Conservation process (Foundations of Success 2009) to guide the development of HMPs, which we refer to as Natural Resource Management Plans (NRMPs).

A Resource of Concern (ROC), as defined by USFWS Habitat Management Plan Policy (620 FW 1), is any plant and/or animal species, species group, or community specifically identified in refuge purpose(s), System mission, or international, national, regional, state, or ecosystem conservation plans or acts. Plant or ecological communities should be considered ROCs when they:

- Are specifically identified in a refuge purpose or associated establishing legislation documents;
- Support species or species groups identified in a refuge purpose or associated establishing legislation documents;
- Support FWS trust resources;
- Are indicative of ecological processes that shape refuge communities (e.g., nutrient cycling, hydrology, soils);
- Are indicative of ecosystem drivers that shape surrounding landscapes (e.g., climate change, watershed variables); or
- Support maintenance or restoration of biological integrity, diversity, and environmental health.

To identify priority ROCs that will be a focus of management, we follow steps 1-5 in "Identifying Refuge Resources of Concern and Management Priorities: A Handbook," hereafter "ROC Handbook" (Paveglio and Taylor 2010) with some modifications. To avoid duplication, we do not repeat all of the text from the ROC Handbook sections here, but instead refer to the relevant page numbers. Steps 6-8 in the ROC Handbook (Identifying Priority Habitats, Setting Goals and Setting Objectives) are not covered in this document. Instead, these steps are covered later in the Open Standards process (Foundations of Success 2009). Priority resources of concern are termed 'conservation targets' in the Open Standards process.

Summary

In Step 1, identify the refuge's purpose(s) by reviewing original decision documents for refuge establishment and/or expansion (e.g., statutes, Land Protection Plans, Conceptual Management Plans, Migratory Bird Conservation Memos and various environmental compliance documents). In Step 2, identify refuge system resources of concern by reviewing the National Wildlife Refuge System Mission, Goals, and Refuge Purposes Policy. In Step 3, consider elements of biodiversity on the refuge (e.g., native fish, wildlife, plants, and communities) according to the FWS Policy on Biological Integrity, Diversity and Environmental Health (601 FW 3.3). For creating the comprehensive list of ROCs (Step 4), compile a list of all species, communities and ecosystems that have been reported to occur on the refuge by consulting refuge species lists found in Comprehensive Conservation Plans (CCPs) and other refuge plans, biological surveys conducted on the refuge, and online databases. To rank the comprehensive ROC list (Step 5) and select the priority ROCs that will be a focus of the Natural Resource Management Plan (NRMP), use filters (such as invasive species status) and a set of criteria (such as listing status or contribution of the refuge to regional or global populations). Instead of following steps 6-8 in the ROC Handbook, these steps are covered later during the Open Standards process. Further details on each step are provided below.

Step 1: Identify Refuge Purposes

ROC Handbook reference: pages 5-7

Background

Refuge purpose statements provided in CCPs are often too general to identify the original intent of the refuge, therefore it is important to examine original decision documents for refuge establishment and/or expansion when identifying refuge purposes. According to the ROC Handbook:

> "Often the specific purpose(s) of a refuge may not be immediately clear. This is because many refuges were established (or subsequent tracts were acquired) under one or more of 15 statutes (e.g., the Migratory Bird Conservation Act, Fish and Wildlife Coordination Act, or Refuge Recreation Act) that authorized acquisition of the refuge. Refuge purpose statements often consist of language excerpted from these statutes, and can be too general to identify the original intent of the refuge. Therefore, it is usually necessary to search further for specific information regarding the intent behind establishment of a refuge or the acquisition of subsequent tracts.
>
> The best source for such specifics is original decision documents for refuge establishment and/or expansion. These documents include Land Protection Plans, Conceptual Management Plans, and various environmental compliance documents required by the National Environmental Policy Act of 1969 (NEPA). These documents may provide more detailed information on wildlife or habitat to be managed on the refuge." (Paveglio and Taylor 2010)

Actions

1. **The I&M team** obtains original decision documents for refuge establishment and/or expansion from the Region 8 Refuge Planning group.
2. **The I&M team** completes Table 1: "Summary of Refuge Establishment," Table 2: "Summary of Species and Supporting Ecosystems Identified in Refuge Purpose" and Table 3: "Summary of Biological Integrity, Diversity, and Environmental Health (BIDEH) for the Refuge" according to the ROC Handbook. These tables are useful for organizing information about refuge establishment purposes and identifying resources for the comprehensive ROC list.
3. **The refuge** reviews ROC tables 1-3 and provides feedback to the I&M team.
4. **The I&M team** adds all species, communities or ecosystems mentioned in refuge purposes (Table 2) to the comprehensive ROC list (used in Step 4, below).

Step 2: Identify Refuge System Resources of Concern

ROC Handbook reference: pages 7-9

Background

Refuge System ROCs are identified in the National Wildlife Refuge System Mission, Goals, and Refuge Purposes Policy (601 FW 1; link here). Refuge System Goals mention fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered; migratory birds, interjurisdictional and anadromous fish and marine mammals (for which the Service has primary management authority); and ecosystems, plant communities, wetlands of national or international significance, landscapes, and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts. The ROC Handbook has a useful section where information on Refuge System Resources of Concern can be found. It is important to note that the Refuge Improvement Act (1997) clarified the relationship of refuge purposes to Refuge System purposes:

> "If a conflict exists between the purposes of a refuge and the mission of the Refuge System, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission of the System."

Therefore, our first obligation is to fulfill and carry out the purpose(s) of each refuge. We may, in order to fulfill the broader Refuge System mission, manage a refuge to achieve additional conservation objectives in a manner that first protects the purpose(s) of the refuge. These additional efforts will be additive and complementary to the achievement of the refuge purpose(s) (601 FW 1).

Actions

1. **The I&M team** familiarizes themselves with Refuge System ROCs. These categories of resources will be scored during the ROC ranking process in Step 5.

Step 3: Address Biological Integrity, Diversity, and Environmental Health

ROC Handbook reference: pages 9-12

Background

Section 4(a)(4)(B) of the National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd-668ee (Refuge Administration Act) states that "In administering the System, the Secretary shall… ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans." This is one of 14 directives to the Secretary contained within the Refuge Administration Act. The Policy on Biological Integrity, Diversity and Environmental Health (hereafter 'BIDEH'; 601 FW 3; link here) provides additional information and guidance on managing a refuge to maintain existing and/or restore lost or severely degraded components of BIDEH, where appropriate.

Maintaining Biological Integrity

According to 601 FW 3, biological integrity is defined as: "Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities." "Historic conditions" is defined as the "composition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape." Note that biological integrity can be considered at multiple landscape scales, which means that a vegetation community lost at a landscape scale can be prioritized for management on a refuge even if that community type did not occur on the refuge historically.

Maintaining Biological Diversity

According to 601 FW 3, biological diversity is defined as: "The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur." The mandate to maintain biological diversity is addressed in two steps of the ROC process. First, the full range of species, community and ecosystem diversity present on the refuge is identified by consulting refuge CCP species lists, vegetation maps and species observation datasets from online sources; these resources are added to the comprehensive list of ROCs (Step 4). Second, the selection of priority ROCs involves considering those resources that best represent overall biological diversity on the refuge (Step 5). Table 3 in the ROC Handbook is a useful table for listing the major existing vegetation communities on the refuge, the dominant plant species that comprise them, the species of conservation concern that they may support, the ecological processes that sustain them and the factors that limit them. Components of this table can be used in later stages of the Open Standards process (e.g., identifying Key Ecological Attributes of ROCs/conservation targets). We do not consider genetic diversity at this time in the ROC process.

Maintaining Environmental Health

According to 601 FW 3, environmental health is defined as: "Composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment." The mandate to maintain environmental health is not specifically addressed in the ROC process because we are focused primarily on biotic, as opposed to abiotic, resources at this time. However, we hope to address this mandate in future versions of the ROC process.

Actions

1. **The refuge** provides the I&M team with references pertaining to the historical ecology of refuge or surrounding lands. This material can consist of reports, surveys, published literature, books, photographs, etc.
2. **The I&M team** searches for scientific literature and historical ecology references to identify species, communities or ecosystems that have been lost or severely degraded on the refuge or at the landscape scale surrounding the refuge.
3. **The I&M team** adds all species, communities or ecosystems that have been lost or severely degraded on the refuge or at the landscape scale to the comprehensive ROC list (Step 4.4). For example, if salt marsh no longer occurs on a refuge but was present historically, this ecosystem would be added to the comprehensive ROC list for further consideration. We do not explicitly consider genetic diversity at this time in the ROC process.

Step 4: Compile Comprehensive List of Refuge Resources of Concern

ROC Handbook reference: pages 15-17

Background

The comprehensive list of ROCs is a table of all species, communities and ecosystems that have been reported to occur on the refuge, their conservation status, their invasive status and whether or not their occurrence has been documented (see Step 4.2b for a definition of documented). This table is comparable to Table 4 in the ROC Handbook with the addition of documentation of occurrence. Steps 4.0-4.4 describe the data processing required for ROC table development. A full guide to Step 4 is provided in Appendix A.

Step 4.0: Review and catalog existing conservation and invasive species lists or plans

Actions

1. **The I&M team** identifies conservation lists/plans and invasive species lists/plans that cover the NRMP project scope and catalogs them in the ServCat online database, if not already entered. Note: We do not at this point consider conservation lists or plans for vegetation communities or ecosystems due to the wide variety of classification systems that exist. We hope to incorporate

this information in the future as definitions for vegetation classes and ecosystem types become more standardized.

2. **The I&M team** reviews the plans and identifies tables of conservation and invasive species status.
3. **The I&M team** records the plan or list name, table numbers and corresponding page numbers in a tracking spreadsheet.

Additional details are provided in Appendix A.

Step 4.1: Create a database of conservation and invasive status for species

Step 4.1a: Extract tables from conservation and invasive species lists/plans and create Excel files

Actions

1. **The I&M team** uses ABBYFineReader or Adobe Acrobat Pro to perform Optical Character Recognition (OCR) and convert scanned lists/plans from Step 4.0 to readable text if the text is not readable.
2. **The I&M team** converts the tables of conservation status and invasive status identified in Step 4.0 into Excel files. During this step, the I&M team standardizes the format of the tables and species names.

Additional details are provided in Appendix A.

Step 4.1b: Create an Access database of conservation and invasive species plan tables

Actions

1. **The I&M team** creates a Microsoft Access database and imports the Excel tables from Step 4.1a.
2. **The I&M team** uses queries to develop lookup tables that include the conservation or invasive species status codes and their definitions found in the conservation and invasive species plans. For example, the NatureServ status code "S1" indicates that a species is "critically imperiled" at the state level.
3. **The I&M team and the refuge** develop a conservation status scoring system and assign conservation status scores to each plan code. Conservation status scores represent the relative significance of a given conservation plan code and are used to synthesize the differing codes across all plans. The simplest (default) scoring system assigns a value of 1 to any conservation status code indicating that a species was of medium to high conservation concern (e.g., "imperiled," "vulnerable," "sensitive," "threatened," "endangered," "at-risk," "vulnerable") and a value of 0 to any status code indicating that a species was of low or no conservation concern (e.g., "least risk," "least concern," "secure," "apparently secure", "presumed stable"). All conservation lists or plans are weighted equally. *Optional:* More complex scoring systems can be used if desired by refuge staff. For example, the S1 code from above might receive a conservation status score of 90 whereas the NatureServe code "S5," indicating that a species is "secure" at the state level, might receive a conservation status score of 10. The conservation

status scoring system can also incorporate weights for each conservation plan. For example, refuge staff may think that a Joint Venture Implementation Plan should carry more weight than a Partners in Flight conservation plan. Conservation status scores and plan weights will differ from refuge to refuge depending on which plans the refuge considers more important. The conservation scores and conservation plan weights, if used, are incorporated into the ROC criteria "Best science and professional judgment" in Step 5, Identifying Priority Refuge ROCs.

Additional details are provided in Appendix A.

Step 4.1c: Integrated Taxonomic Information System (ITIS) name standardization

Actions

1. **The I&M team** imports the table of existing ITIS names from Region 8 species lists into the Access database created in Step 4.1b.
2. **The I&M team** uses a series of queries to reconcile the species names in the conservation and invasive plan tables to the ITIS names.
3. **The I&M team** runs additional queries to create a table of species names that could not be reconciled to the Region 8 species lists for review by species experts.
4. **Species experts** reconcile problematic species names to the ITIS standard, if needed.
5. **The I&M team** imports the reconciled list into the Access database and updates the conservation plan tables with the new ITIS species names.
6. **The I&M team** repeats the above process each time a new table is added and species names need to be standardized to ITIS.

Additional details are provided in Appendix A.

Step 4.2: Populate species, community and ecosystem occurrence tables

Step 4.2a: Compile existing species lists (CCPs/websites)

Actions

1. **The I&M team** imports species lists compiled in 2012 by the Region 8 I&M team, if available, into the standardized species list Access database.
2. **The I&M team** finds any existing species lists from a CCP document, the refuge website or refuge files if the species lists are not available from the 2012 I&M project.
3. **The refuge** provides species documentation information to the I&M team, if needed.
4. **The I&M team** imports the species list(s) into a standardized excel table format.
5. **The I&M team** follows the same process described in Step 4.1a to standardize species names and table format.
6. **The I&M team** imports the standardized tables into the Access species list database.
7. **The I&M team** reconciles the species names to the ITIS standard using the process described in Step 4.1c. In many cases, a species name will occur on both CCP and website lists. Unique species names are identified by running a series of queries. The queries for the unique names will use the ITIS standardized names because in some cases the "original" versions of the names

from the CCP and website might be different, but the ITIS standard name is the same. For example, the CCP might be using an outdated version of the species name and the website might have the updated version of the species name.

Additional details are provided in Appendix A.

Step 4.2b: Compile species observation data from online sources

Background

To be considered "documented," an observation record at a minimum must include the species name (what), when it was seen (date), where it was seen (location – preferably lat/long) and who saw the species (observer). Documentation of occurrence on the refuge is not required for future steps in the ROC process or for developing an NRMP. However, it does provide some assurance that a species, community or ecosystem actually occurs on the refuge and lays the groundwork for future efforts to standardize refuge species lists.

There are several online sources for species observation data. The two primary sources that we use in the ROC process are the Avian Knowledge Network (AKN) for birds and USGS Biological Information Serving Our Nation (BISON) for all taxa. The AKN data was downloaded for Region 8 in 2013 and will need to be downloaded once a year. BISON data is downloaded for each refuge as needed.

Actions

1. **The I&M team** verifies that the AKN and BISON versions are current; if not, a new version is downloaded.
2. **The I&M team** queries the online data sources for records occurring within the refuge boundary (defined as the most current FWS boundary interest GIS layer).
3. **The I&M team** imports the records occurring in the refuge boundary into the standardized Access observation database.
4. **The I&M team** crosswalks the imported records into the standard table format and combines them into a single observation table.
5. **The I&M team** repeats the ITIS standardization process for species names (Step 4.1c).

Additional details are provided in Appendix A.

Step 4.2c: Compile species observation data from hardcopy/digital files

Background

We primarily rely on online databases for species documentation, however, in some cases it is necessary to incorporate species observation data from hardcopy or digital files found at the refuge. For example, refuges that are closed to the public may have few species records in AKN or BISON, making it necessary to compile data from other available sources.

Actions

1. **The refuge** identifies key hardcopy and digital files with species observation data for the NRMP project scope

2. **The I&M team** catalogs the hardcopy and digital files in the ServCat online database, if not already entered.
3. **The I&M team** follows the same data processing steps described in steps 4.1a – 4.1c for hardcopy and digital files. For hardcopy documents, ABBYFineReader can be used to OCR the documents and extract the text.
4. **The I&M team** imports the extracted species observation data (species name, date, location and observer) into the Access observation database table and records the source of the observation (citation of the report or other document/file) in the table.
5. **The I&M team** imports the digital files into the Access observation database and crosswalks them into the standard table format.
6. **The I&M team** repeats the ITIS standardization process for species names (Step 4.1c).

Additional details are provided in Appendix A.

Step 4.2d: Compile community and ecosystem lists from CCPs

Actions

1. **The I&M team** obtains a list of the vegetation communities and/or ecosystems that occur on the refuge by consulting the CCP.
2. **The refuge** reviews and refines the list of vegetation communities and/or ecosystems to arrive at the communities and ecosystems that will be considered for the ROC process. In some cases the communities or ecosystems may be lumped or split as the ROC process unfolds based on management similarities or differences, spatial relationships, etc.
3. **The I&M team** enters the final list of communities and ecosystems into the comprehensive ROC table (Step 4.4).

Step 4.3: Create documented species list

Actions

1. **The I&M team** creates the final documented species list with a set of queries between the species list developed in Step 4.2a and the tables of observations from Steps 4.2b and 4.2c.
2. **The I&M team** creates a new Access database and import the tables from Steps 4.2a – 4.2c.
3. **The I&M team** runs queries using the ITIS scientific name fields and identifies species that occur on the refuge species list and the species observation lists.
4. **The I&M team** runs a query to identify the species that occur on the observation lists but not on the refuge species list.
5. **The I&M team** adds species that have an observation but were not on the refuge species list to the species list. The result is a complete list that has both species that we think occur on the refuge and species that we have documented sightings for.

Additional details are provided in Appendix A.

Step 4.4: Create comprehensive ROC table

Actions

1. **The I&M team** develops the comprehensive ROC table using a set of queries between the documented species list (Step 4.3) and the conservation plan and invasive species plan tables (Step 4.1a – 4.1d). The I&M team first creates an ROC Access database and imports the relevant plan tables and the documented species list.
2. **The I&M team** runs queries based on the ITIS scientific name to add the conservation status scores to the documented species list table. The query is repeated for each conservation plan and invasive species plan.
3. **The I&M team** uploads the final table, consisting of original species names, ITIS species names, species documentation and scores from conservation and invasive species lists/plans, as a Google spreadsheet.
4. **The I&M team** adds species that were identified in refuge purposes (Step 1) to the comprehensive ROC table if they are not already on the list.
5. **The I&M team** adds communities and ecosystems that contribute to biological integrity, diversity and environmental health (Step 3) to the comprehensive ROC table if they are not already on the list.
6. **The I&M team** adds communities and ecosystems from Step 4.2d to the comprehensive ROC table if they are not already on the list.

Additional details are provided in Appendix A.

Step 5: Identify Priority Refuge Resources of Concern

ROC Handbook reference: pages 18-21

Background

The overall goal of Step 5 is to condense the comprehensive list of ROCs to a smaller set of priority ROCs that will be managed to fulfill requirements from refuge purposes, Refuge System mission, and BIDEH policy. Most refuges will end up with many hundreds of ROCs in the comprehensive ROC table. Defining priority ROCs narrows the scope of focus for management and measurement. Priority ROCs should be defined such that they represent the broader suite of biological diversity that exists at a site. There is no standard number of priority ROCs, but generally it is better to select the lowest number that will allow you to benefit the greatest number of other ROCs (we recommend no more than 10). The final work product from this step is a list of the priority species/communities/ecosystems that will become a focus of the rest of the NRMP document.

Step 5.1: Define filters and criteria for ROC ranking

Background

The I&M team developed one filter and eight criteria that can be used to rank ROCs (Table 1). Additional information on rating scales is provided in Appendix C. The refuge can add or remove filters/criteria as appropriate and/or alter the definitions and measurement scales of the criteria. The hope is to keep them somewhat standardized across stations, but they do not need to be identical.

Table 1. Criteria and filters for ranking Resources of Concern (ROCs).

Name	Description
Invasive species status (filter)	Is the species classified as an Invasive Species? Executive Order 13112 Section 1. Definitions. (f) "Invasive species" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Executive Order 13112 of February 3, 1999 - Invasive Species Federal Register: Feb 8, 1999 (Volume 64, Number 25)
Contribution of the refuge (rapid and extended methods)	How important is the refuge globally, at the Flyway scale, regionally and locally for the species, community or ecosystem?
Tribal importance	Is the species, community or ecosystem identified by Native Americans as culturally important?
Contribution to refuge purpose	Is the species, community or ecosystem identified in the Refuge purpose and/or enabling legislation?
Site capabilities	Does the refuge have the capability (currently or through restoration) to provide the components necessary for the needs of the species, community or ecosystem (e.g., foraging areas for wintering waterfowl or suitable soil types for native grasslands etc.)?
Best science and professional judgment	How does the species, community or ecosystem rank on conservation priority (excludes federal and state plans)?
Listing status or designation	Is the species, community or ecosystem federally listed, state listed, identified as a trust resource, or have other national /regional /local status or designation?
Ecological relationships	How well does the species, community or ecosystem represent key ecological conditions and processes on the refuge and surrounding landscape, or how well does the species, community or ecosystem act as a direct indicator of ecosystem health on the refuge and surrounding landscape and/or represent biological integrity, diversity, and environmental health (BIDEH)?
Benefit to people	How much does the species, community or ecosystem benefit people? For example, pintail can be hunted, salt marshes provide flood protection, etc.

Actions

1. **Refuge staff** review existing ROC filter, criteria and rating scales and generate a list of desired edits or changes. To facilitate this review, the I&M team should assign the refuge the task of scoring 5-10 ROCs using the I&M filter and criteria.
2. **The I&M team and refuge staff** hold a webinar to review and refine the filter and criteria for ROC ranking.
3. **The I&M team** makes edits to the filter(s) and criteria and sends the updated definitions to the refuge. Sharing the definitions as a Google doc is recommended.

Step 5.2: Apply filters

Actions

1. **The I&M team** removes the species that meet the filtering criteria from consideration as priority ROCs, such as species that are listed as invasive or noxious. In the Google spreadsheet from Step 4.4, this can be accomplished using a multiplier of zero, which results in a final ROC score of zero.

Step 5.3: Rank ROCs

Actions

1. **Refuge staff** assign a weight to each criterion. This can be done in several ways, such as letting each staff member individually allocate 100 total points among the criteria and taking an average (this can be done efficiently using a Google doc spreadsheet where each staff member has their own tab for scoring) or weighting the criteria in a group. Different refuges may assign different weights to each criteria.
2. **The I&M team** enters scores for all ROCs into the comprehensive ROC table Google doc for the following criteria: 'contribution to refuge purpose,' 'best science and professional judgment' and 'listing status or designation.' The I&M team manually scores the 'contribution to refuge purpose' criterion using the rating scale in Appendix C. 'Best science and professional judgement' and 'listing status' scores come from the conservation list/plan scores that are already in the comprehensive ROC table. Adjustments for federal trust resource are manually entered (Appendix C).
3. **The I&M team** calculates an average ROC score weighted with the refuge weights from above for each ROC and sorts the comprehensive ROC table. In consultation with the refuge, the I&M team selects a threshold to identify those ROCs that will proceed to the next phase of scoring ('Level A' ROCs) because they have high conservation value, are related to refuge purposes and/or are listed by the feds or the state and/or are a trust resource vs. those ROCs that will not proceed to the next phase of scoring ('Level B' ROCs) because they have low conservation value, are not related to refuge purposes and/or are not listed by the feds or the state and/or are not a trust resource.
4. **The I&M team** enters scores for all Level A ROCs into the comprehensive ROC table Google doc for the 'contribution of the refuge' criterion. There are two alternatives for scoring this criterion. In the rapid method, a single cutoff value is used to determine if the refuge contributes significantly to the species, community or ecosystem at the global, Pacific Flyway, regional or local scales (see Appendix C). In the extended method, the percent contribution of the refuge to the species, community or ecosystem at the global, Pacific Flyway, regional or local scales is calculated at each scale using available data. The global scale is assigned a weight of 4, the Pacific Flyway scale is assigned a weight of 3, the regional scale (defined by the refuge) is assigned a weight of 2 and the local scale (defined by the refuge) is assigned a weight of 1. A weighted score is then calculated by multiplying the percent contribution at each scale by the assigned weight (see Appendix C). For example, if a refuge has 0.001% of the global acreage of

tidal marsh, 4% of acreage in the Pacific Flyway, 15% of the acreage in the region and 61% of the acreage in the local area, the weighted score would be: 4*0.00001+3*0.04+2*0.15+1*0.61 = 1.03. Data may not be available at each scale for every Level A ROC; in this case, the area of the refuge relative to the area of each scale can be used to calculate a default value. This is equivalent to assuming that the refuge contributes to the ROC in proportion to its area. Because this system can result in scores greater than 3, the I&M team rescales the resulting values to 0-3.

5. **The refuge** enters scores for all Level A ROCs into the comprehensive ROC table Google doc for the 'tribal importance,' 'site capabilities,' 'ecological relationships' and 'benefit to people' criteria.
6. **The I&M team** holds a webinar during the scoring period to touch base with the refuge and make any final adjustments to the criteria weights and/or rating scales. This is also an opportunity to assess whether any Level B ROCs should be elevated for consideration.
7. **The I&M team** calculates a weighted average score for each Level A ROC across all criteria using the criteria weights provided by the refuge. This score is used to rank the ROCs. All of the calculations are performed in a Google spreadsheet that is shared with the refuge and contains the comprehensive ROC table created in Step 4.4. This provides transparency to the refuge and allows them to experiment with different weights on different criteria. While it seems daunting at first to score perhaps hundreds of ROCs across multiple criteria, in practice many ROCs will have a similar score, and only a handful will require additional work to determine the appropriate score.

Step 5.4: Select the final subset of priority ROCs

Background

In this step, the refuge selects a subset of priority ROCs from the comprehensive ROC table. There is no standard number of priority Resources of Concern, but generally it is better to select the lowest number that will allow you to benefit the greatest number of other ROCs. Since most refuges lack the resources to measure a large number of indicators, it is important to keep the overall number of priority ROCs to a manageable level. Regardless of the size of the project scope, it is almost always possible to select a focused list of up to 10 priority ROCs that best capture both the biological diversity of the refuge, as well as important threats and key conditions for success. Identifying priority ROCs can be vital to refuge management efforts because they also have a considerable umbrella effect in determining conservation success; conserving or restoring these priority ROCs will allow you to conserve many other ROCs not explicitly selected (Foundations of Success 2009).

The general approach to narrowing down the comprehensive list of ROCs to the short list of priority ROCs is to start by selecting high-scoring ecosystems or communities because they tend to encompass a large amount of the biological diversity in a given area. Next, select those species or groups of species with high scores from Step 5.3 that are subject to threats that would continue even if the ecosystems or communities that support them were conserved (e.g., hunting, fishing, disease, competition or predation from invasive species). Next "lump" or "split" ROCs as necessary to arrive at no more than 10. As a general rule, you will want to lump several ROCs into one if they:

- Co-occur on the landscape;
- Share common ecological processes;
- Share similar critical threats; and therefore
- Require similar conservation strategies.

The Open Standards Training Manual provides some common examples of targets that could be lumped (Foundations of Success 2009). For example, you may want to lump:

- A forest block and its associated plant and animal species if the only factors that are affecting the survival of the associated species are the health and areal extent of the forest.
- Groupings of animals or plants that share a common ecological process or behavior (e.g., fish-eating birds or vernal pool invertebrates).
- Similarly, any species or ecosystem that falls under an umbrella species could be lumped with that umbrella species; e.g., northern spotted owls have been recognized as an umbrella species for terrestrial molluscs and salamanders (Dunk et al. 2006).

The process of lumping may result in "nested targets." For example, American white pelican, double-crested cormorant, Caspian tern, California gull and great blue heron were lumped into a single target/priority ROC of "colonial nesting birds" for Anaho Island NWR. In this case, the individual species were nested under a single priority ROC.

Conversely, you may want to split ROCs if they:

- Include species/communities/ecosystems that occur in different places on the landscape;
- Include species/communities/ecosystems that are affected by different ecological processes;
- Include species/communities/ecosystems that do not share common threats; and therefore
- Require different conservation strategies.

The Open Standards Training Manual provides some common examples of targets that could be split (Foundations of Success 2009). For example, you may want to split:

- Animal or plant species that are directly subject to threats not related to habitat per se (e.g., intense hunting pressure, competition or predation from non-native invasive species, disease, etc.). In such cases, conserving their habitat will likely not be sufficient to guarantee their survival.
- Wide-ranging or migrating species that might be subject to threats that fall outside of the project area.
- Politically important species or ecosystems that could be used to generate public support for (e.g., a charismatic animal or a historically important or symbolic species).

Actions

1. **The I&M team** assigns the refuge the task of reviewing the sorted comprehensive ROC table from Step 5.3 and developing a draft list of no more than 10 priority ROCs, which can have nested ROCs, that represent the overall biodiversity on the refuge and cover all of the most important conservation targets. The I&M team should provide the refuge with recommendations for how to do this (see Background above).

2. **The I&M team and the refuge** hold a conference call to review the draft list of priority ROCs and select the final priority ROCs. On this call check to ensure that: (1) each priority ROC is of conservation value in and of itself (e.g., pasture should not be selected as the priority ROC if it is only valued because it provides foraging habitat for Aleutian cackling geese); (2) all elements of biological integrity, diversity, and environmental health are addressed by the suite of priority ROCs; (3) priority ROCs have been appropriately lumped and split; and (4) all high-ranking ROCs have been addressed. Through discussion with the refuge, arrive at a consensus on the final subset of priority ROCs that incorporate the highest-ranked ROCs from Step 5.3 and best represent biological diversity and biological integrity at the site (and at larger scales, if appropriate). Developing the final priority ROC list is an iterative group process. One person is rarely knowledgeable enough to develop a robust list of representative priority ROCs on his/her own. The actual process of lumping and splitting ROCs as a group is most easily accomplished in person or on a webinar using a software package like Microsoft Powerpoint.

Next Steps

The final list of priority ROCs is not set in stone but may be revised and reorganized during future steps in the NRMP process. Instead of following steps 6-8 in the ROC Handbook, we use the Open Standards process to: (1) identify key ecological attributes (KEAs) of the priority ROCs/targets; (2) conduct a viability assessment; and (3) develop goals, objectives, and strategies to benefit the selected ROCs. Refer to the Open Standards Training Manual for further information about these steps (Foundations of Success 2009).

References

Dunk, J. R., W. J. Zielinski, and H. H. Welsh. 2006. Evaluating reserves for species richness and representation in northern California. Diversity and Distributions 12:434–442.

Foundations of Success. 2009. Conceptualizing and Planning Conservation Projects and Programs: A Training Manual Based on the Conservation Measures Partnership's Open Standards for the Practice of Conservation. Bethesda, MD, USA.

Paveglio, F. L., and J. D. Taylor. 2010. Identifying Refuge Resources of Concern and Management Priorities: A Handbook. Washington, DC.

Appendix A. Detailed Guide to Developing the Resources of Concern (ROC) Table

Prepared by Kaylene Keller and Naomi Kalman October 22, 2015

Contents

Developing the Resources Of Concern Table: Overview

Developing the Resources Of Concern (ROC) table requires capture and manipulation of several datasets. The following section describes the process used to develop an ROC table. The following are the five major steps in the process:

- Step 1a: Review and catalog existing conservation and invasive species plans for species, communities and ecosystems
- Step 1b and 1c: Create a database of conservation and invasive status for species, communities and ecosystems
- Step 2a, 2b, 2c: Populate species, community and ecosystem occurrence tables
- Step 2d: Create documented species list
- Step 3: Create comprehensive ROC table

File Organization

The first step in setting up the NRMP and ROC file organization is to create the project folder for the specific NRMP that is being developed.

The project directory follows the Z:\I_M\Projects\NRMPs\ProjectStructureNEW_customized_toNRMP directory structure (see Appendix 1).

Copy and paste the customized directory structure into the Z:\I_M\Projects\NRMPs directory.

Change the directory name to <LIT or Refuge/ComplexName>. This is the "Project" folder.

Figure 1 shows the Humboldt NWR project folder. The full path name for the project folder is Z:\I_M\Projects\NRMPs\Humboldt.

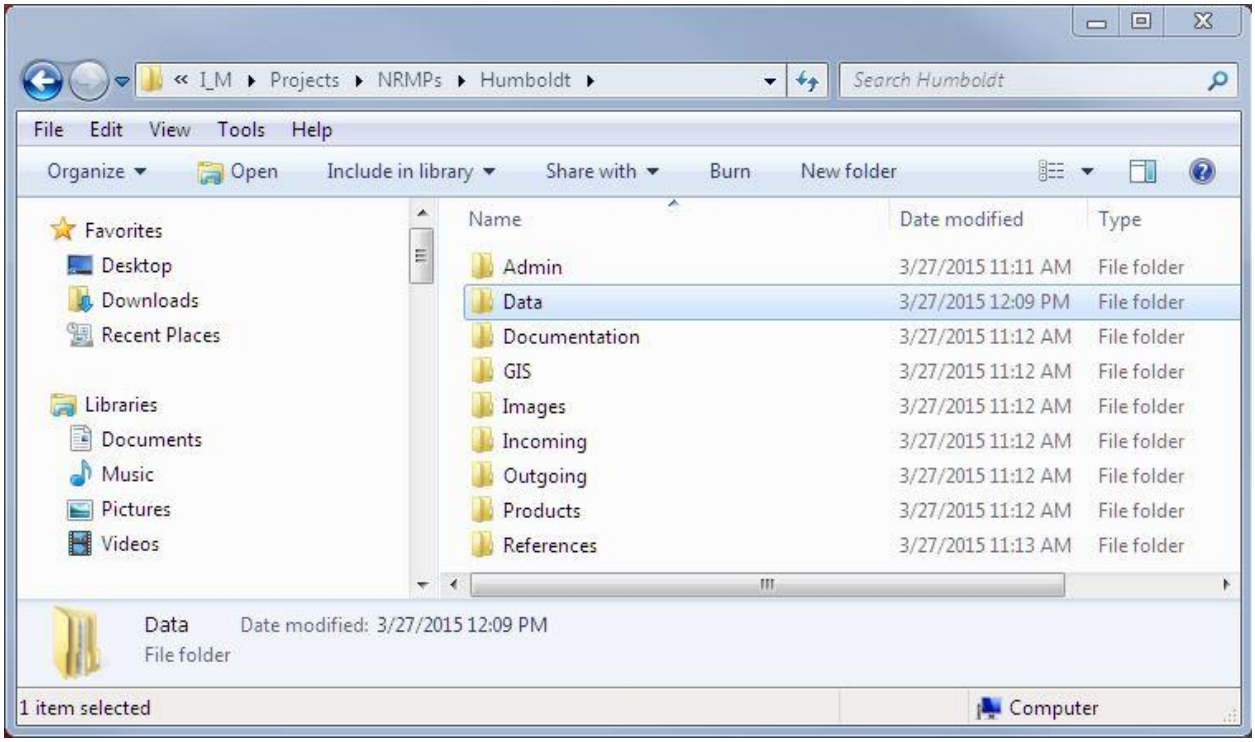


Figure 1 : Project Folder directory structure

The majority of the ROC data processing will occur in the "<Project>\Data\ROC_Development" folder. Within the ROC_Development folder is a space for each step of the process: reviewing the plans, developing the species lists, and bringing them together into the final ROC table. Figure 2 shows the ROC_Development folder for the Humboldt NWR project.

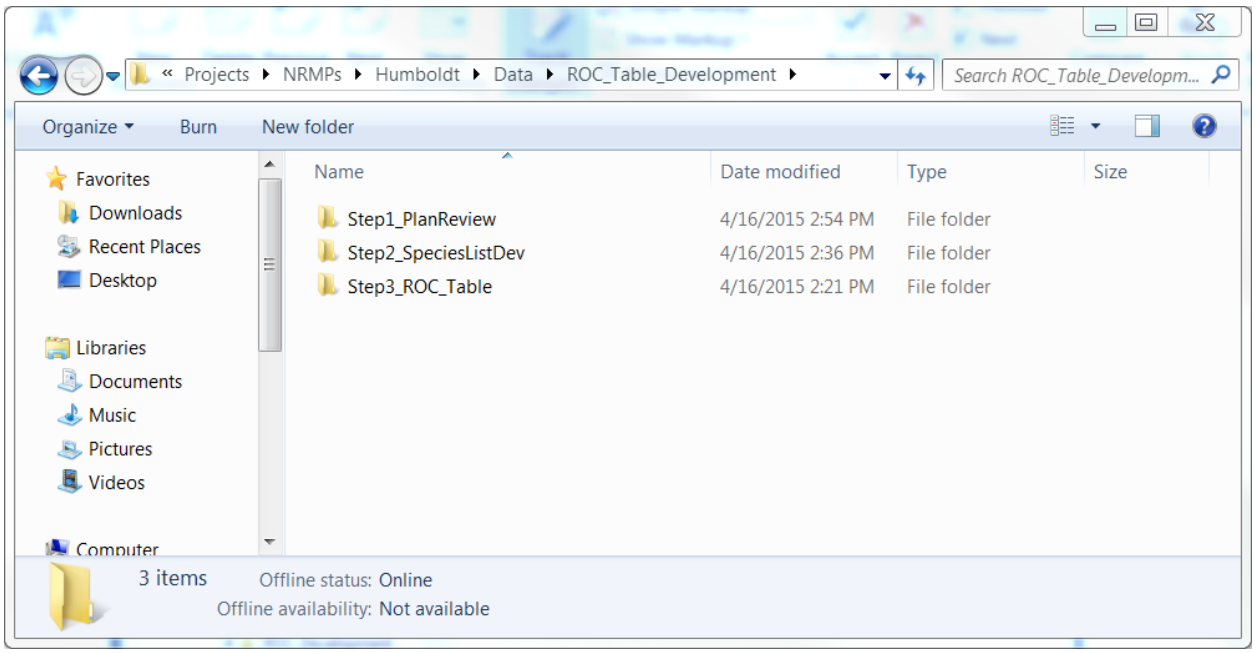


Figure 2 : ROC_Development Folder directory structure

Step1_PlanReview: Reviewing and processing the plans is Step 1 in the ROC table development. There are three subfolders corresponding to the three processing steps. The directory structure for the Step1_PlanReview folder is shown in **Error! Reference source not found.**.

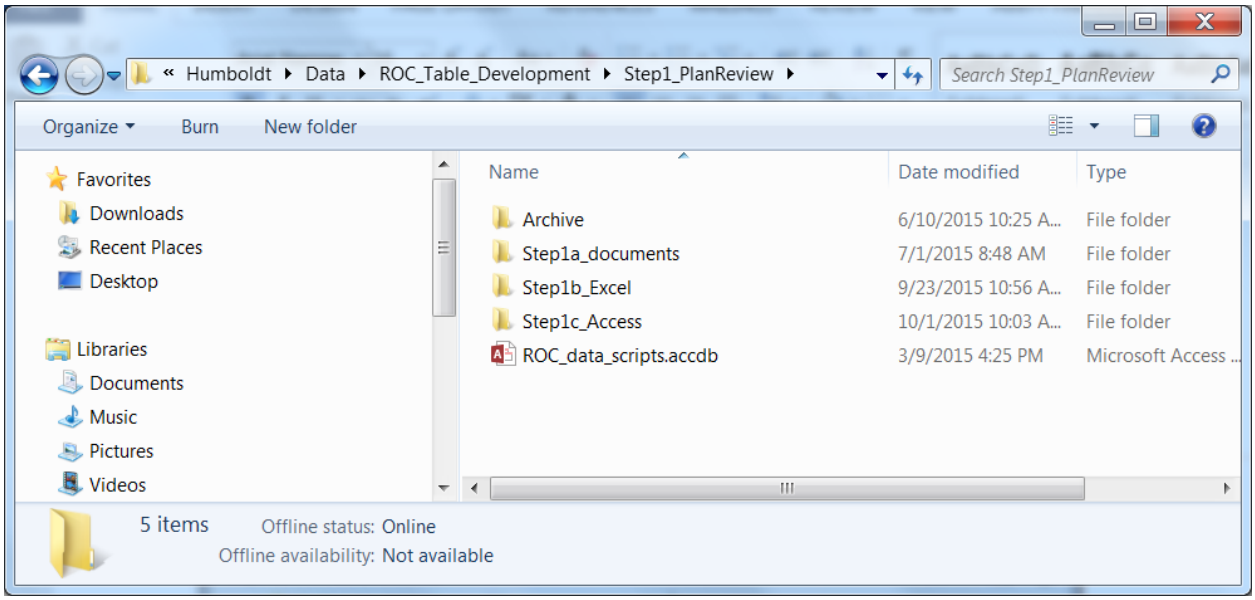


Figure 3 : Step1_PlanReview Folder directory structure

Step1a_Documents: stores a collection of files to go in the ROC table. New files that are downloaded for the project go into the Step1a_Documents folder. As the documents are

processed/reviewed they are sorted into subfolders indicating their status. The subfolders (described below) are shown in Figure 4.

Complete: Any table(s) have been extracted from the original document, formatted and cleaned in Excel, brought into the ROC database to have the species names standardized, and have metadata recorded.

DontNeed: Documents or files that were downloaded because they were of potential interest, but did not meet some criteria for the project (usually outside of our area)

Questions: Documents that are of questionable utility for the project, and documents that are in the process of being cleaned and have encountered some kind of uncertainty or problem

SupportingDocs: Documents related to the main document but that do not contain their own tables, such as implementation strategies, outreach literature, and older versions of the same plan.

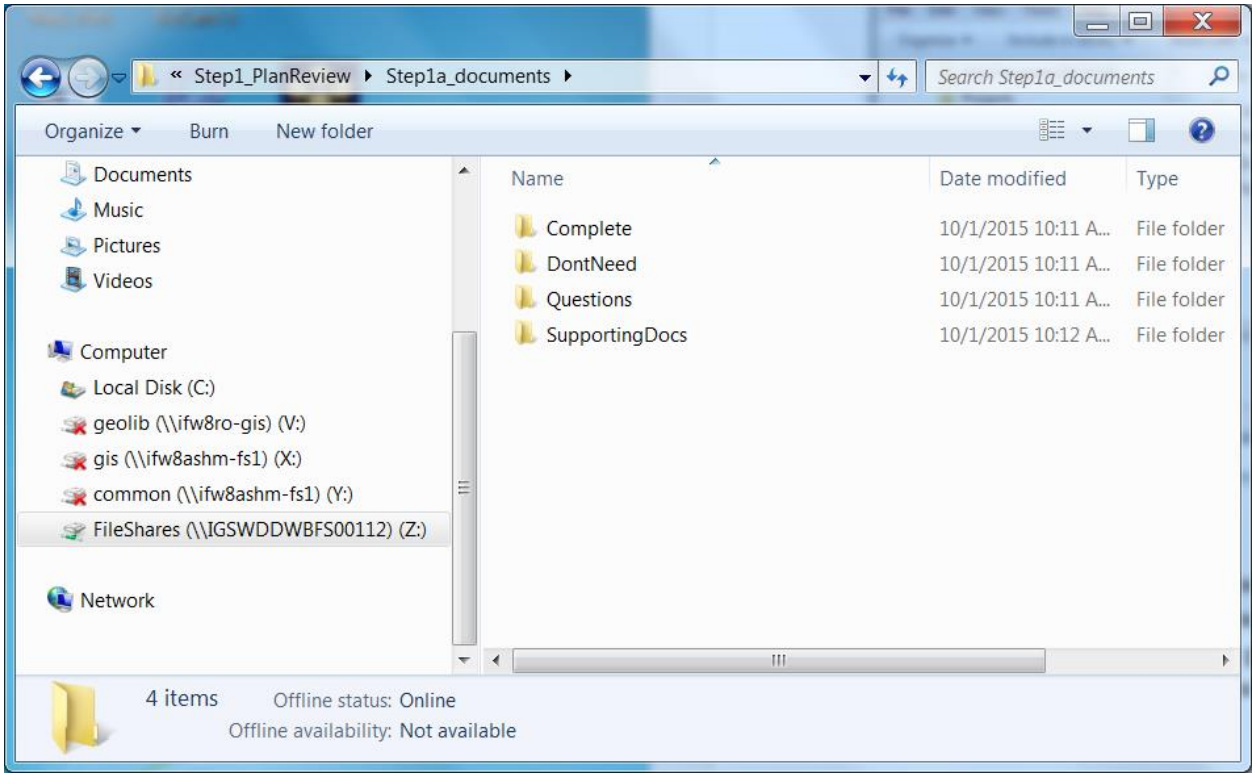


Figure 4: Step1a_Documents Folder directory structure

Step1b_Excel: a place to process tables extracted from documents. This folder contains a template with the fields to include in the ROC table. The subfolders follow the same guidelines

as for sorting the plan documents. The Excel file should be sorted into the same folder as the corresponding source document.

Step1c_Access: The access database with the collection of tables exported from Excel and ready to be cleaned and standardized. You will also need a copy of the access database that contains all of the files that have already been processed in previous NRMPs.

Step2_SpeciesListDev: This folder contains the steps for processing available species lists from the refuge, additional information from web sources and hardcopy sources. The subfolders are shown in Figure and described below.

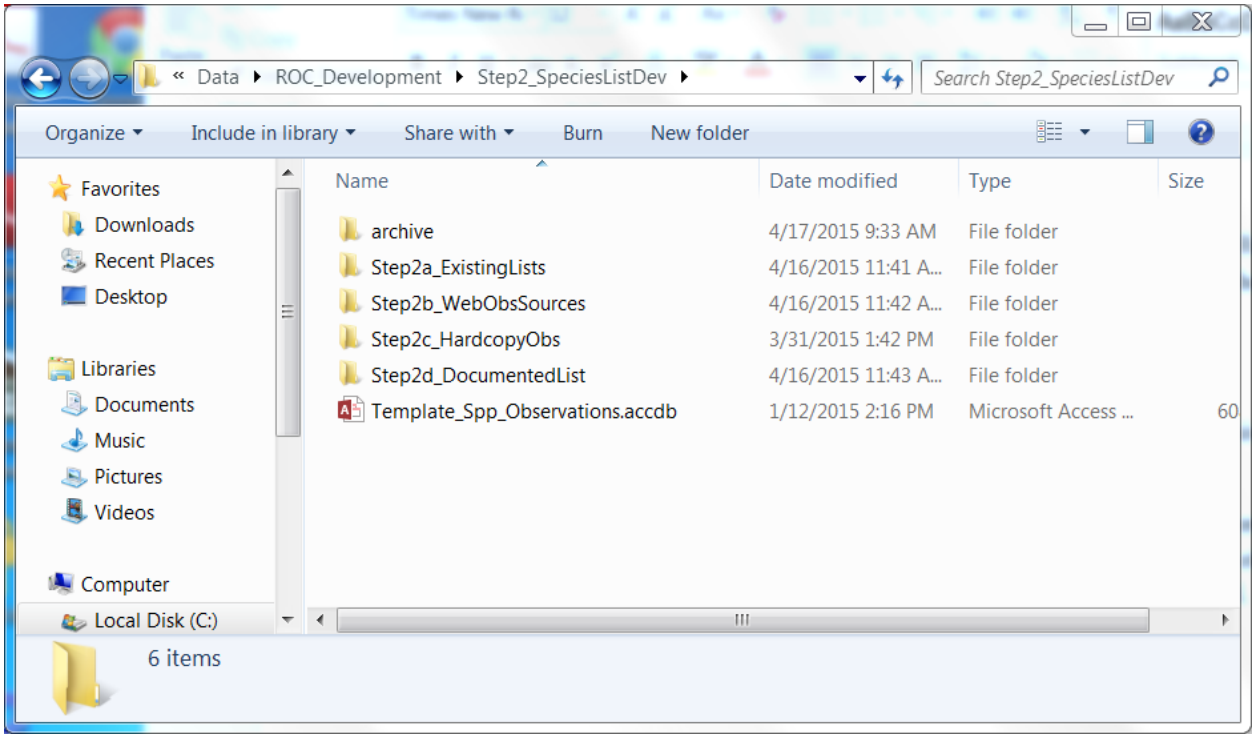


Figure 5: Step2_SpeciesListDev Folder directory structure

Step2a_ExistingLists: Available species lists. This can be from the refuge species lists (CCP/Weblists) or refuge files. All of the lists are standardized to the species table format.

Step2b_WebObsSources: Species observation records downloaded from on-line systems such as Avian Knowledge Network (AKN), USGS BISON, iNaturalist etc.

Step2c_HardcopyObs: Lists of species observations. These can be from hardcopy documents or refuge digital files.

Step2d_DocumentedList: Database contains the combined data from the existing lists, web observation data and hardcopy observation data. The final product is a single table of all the species for the refuge and if there is evidence that the species occur on the refuge.

Step3_ROC_Table: This folder is where the species lists and conservation plan data is integrated into the single ROC table.

Terms

Terms that are bracketed by < > are variables that will change with each refuge etc.
For example <LIT>_ROC<Taxon>List.accdb will be changed to ANH_ROC_BirdList.accdb for the Anaho Island ROC Bird List Access Database.

Taxon: This term is used to refer to species groups of Birds, Plants, Mammals, Inverts, Reptiles and Amphibians. This will be used in standard naming conventions.

Working Directory: This is the directory in which the described steps occur. The top of the directory is always Z:\I_M\Projects\NRMPs.

<Project> directory: The directory for a specific Refuge or Complex. For example: Z:\I_M\Projects\NRMPs\Anaho is the <Project> directory for the Anaho NWR.

<Plan_Name>: The name assigned to the document or resource, which has the convention <Agency>_<ShortTitle>_<PublicationYear>. For example: the Partners in Flight Landbird Conservation Plan of 2004 would have <Plan_Name> = PIF_LandbirdConsPlan_2004

<Table_Name>: The conservation table extracted from the plan. A plan can have more than one <Table_Name>, for example Table 1 and Appendix A.

<ConsTable>: The unique combination of <Plan_Name> and <Table_Name>_<D or L>. (Note: the letters D or L refer to Data or Look up Table)

Tbl_PIF_LandbirdConsPlan_2004_Table1_D and Tbl_PIF_LandbirdConsPlan_2004_AppendixA_D are each a <ConsTable>

Master Metadata file: stored as a template in the folder directory template, this is the catalog of the sources that were examined for all ROC projects to date. Add to and edit a copy of this file with new project-specific sources.

<Plan_Metadata> or Plan Metadata: The database cataloging all of the resources and tables and plans, with updates from the current project. Named Plan_Metadata_<LIT>.accdb, it should be updated very frequently.

<Master_ROC_Set> or Master ROC Set: stored as a template in the folder directory template, this is the collection of resource tables from all ROC projects to date. Add to and edit a copy of this file with new project-specific sources.

<Plan_ROC_Set> or Plan ROC Set: The collection of tables from various plans, with additions from the current project.

Species list or <SpeciesList> (<Taxon>SpeciesUnique): The standardized (ITIS) list of Species Names for a given taxonomic group.

Species Observation Database (<LIT>_<Taxon>_List.accdb): Collection of Refuge-specific species lists based on Coordinated Conservation Plans (CCP).

Species Observation List or <ObsList> (Tbl_<LIT>Spp_<Taxon**>)**: List of species from a Refuge CCP or other document.

Web Observation Database (<LIT>_<Taxon>_ObservationsWeb.accdb): Collection of species lists from web sources such as Avian Knowledge Network (AKN) and Biodiversity Information Serving Our Nation (BISON).

Web List or <WebList> (Tbl_Spp<LIT>_<WebSource>_ObservationsWeb): List of species by taxa from web sources such as AKN and BISON. If multiple refuges are processed at the same time something else can be used for <LIT>. The <Taxon> can also be added to the name if different sources target species groups.

Hardcopy Observation Database (<LIT>_<Taxon>_ObservationsHC.accdb): Collection of species observations from Refuge hardcopy documents.

Hardcopy List or <HClist> (<Tbl_Spp<Taxon>_ObservationsHC): List of species observations extracted from hardcopy files.

Names to Clean table (<Taxon>NameToClean): list of species that did not have a match in our existing ITIS species lists (<SpeciesList>) and need to be investigated. This list is updated with the names found by investigation, and is used to update the <SpeciesList>.

Clean Names table (<Taxon>CleanNames): The output from the ITIS.gov website that is used to update the Names to Clean (<Taxon>NameToClean) table.

Documented Species Database (Species_Lists_Documented.accdb): collection of documented species lists; the combined lists from all sources for a refuge.

Documented Species List (Tbl_<LIT>_SpeciesList): combined documented species list for the refuge. All of the taxon are in a single list.

Step 1[1]: Compile Comprehensive List of Refuge Resources of Concern.

Step 1a: Review and catalog existing conservation and invasive species plans for species, communities and ecosystems

Working directory for this Step:
<Project>\Data\ROC_Development\Step1_PlanReview\Step1a_Documents
Sample document for this step: Partners in Flight, 2004. Landbird Conservation Plan. Table 1.
Sample Refuge and LIT: Humboldt HMB

The working directory contains a place to store and process plans downloaded from sources besides ServCat, a place to process the tables, and a place to develop a preliminary ROC table.

1. Rename the Master Metadata file (located in the Step1_PlanReview folder) to Plan_Metadata_<LIT>. accdb. (In this documentation this will be called Plan Metadata)

Renaming the database provides documentation about which database was used for the specific NRMP that the ROC table is developed for.

   a. Example For Humboldt:
      Z:\I_M\Projects\NRMPs\Humboldt\Data\ROC_Development\Step1_PlanReview
      \Plan_Metadata_HMB.accdb
2. Review the list of plans in the Plan_Metadata _<LIT>.accdb (Plan Metadata) that have been evaluated and processed on previous NRMP projects.
3. Search ServCat for species conservation plans and invasive species plans that are not listed in Plan_Metadata _<LIT>.accdb (Plan Metadata) that cover the NRMP project scope.
4. Identify additional species conservation plans and invasive species plans relevant to the NRMP project scope that are not yet in ServCat or Plan Metadata by consulting Refuge staff and searching the internet.
5. Download the PDF files for appropriate plans from Step **Error! Reference source not found.** and 4 above into the \Step1a_Documents subfolder.
   a. Name them according to the following convention: Agency_ShortTitle_PublicationYear (in this documentation this is called the <Plan_Name>)
   b. Example: Partners in Flight Landbird Conservation Plan of 2004 would have <Plan_Name> = PIF_LandbirdConsPlan_2004
   c. List and describe them in the Plan Metadata database (Plan_Metadata _<LIT>.accdb).
6. Enter the new plans from Step **Error! Reference source not found.** and 4 above into ServCat (note: entering documents into ServCat requires training by a regional I&M data manager).

[1] Note: Step 1 in this document is Step 4 in BIDH

7. **NOTE: the following section is a suggestion and R8 has used Mendeley but has not entered all of the plans into ServCat as of 10/1/2015.* Obtain the bibliographic data from ServCat for the plans identified above and import into Mendeley or other reference management program (e.g., EndNote, RefWorks). We recommend using Mendeley because it is free and has specialized tools that allow for easy extraction of bibliographic data from scanned documents. Bibliographic data from ServCat cannot be directly imported into Mendeley. Instead, it must be imported to EndNote first and then exported to a format that Mendeley accepts.
    a. Install Mendeley (see Appendix B for information on downloading and installing Mendeley)
    b. Download the ServCat search results using the "Download" button and select the EndNote format (.enw).
    c. Open a free online EndNote account (https://www.myendnoteweb.com/).
    d. Open the new EndNote account and import the .enw file that was downloaded from ServCat into EndNote using Collect > Import References > Choose File > EndNote Import > To New Group (you will be prompted to name the new group).
    e. Go to Format > Export References. Select the group you want to export, select RefMan (RIS) export format, and click "Save." The references will be saved as a text file.
    f. Open Mendeley Desktop and go to File > Import > RIS - Research Information Systems (*.ris). In the Add Files pop-up window, change the file type to Text (*.txt). Navigate to the file that you exported from EndNote and select it. Click "Open" and the references should be imported into Mendeley. Additional details on using Mendeley can be found in Appendix B.
8. Keep ServCat and Mendeley updated as new conservation or invasive species plans are identified during the development of the NRMP. It is recommended that one staff member involved in the NRMP process be tasked with keeping ServCat and Mendeley up to date. A copy of the most recent Mendeley file should be kept here: Z:\I_M\Projects\NRMPs\<Project>\References.
9. Keep the Plan Metadata updated with new plans and progress. Once the ROC Table is complete the metadata database is copied back to the Z drive (Z:\I_M\Projects\NRMPs\ProjectStructureNEW_customized_toNRMP\Data\ROC_TableDevelopment\Step1_PlanReview) and becomes the new Master Plan Metadata.

Step 1b: Extract tables from conservation and invasive species plans and standardize the extracted tables

Working directory for this Step:
<Project>\Data\ROC_Development\Step1_PlanReview\Step1b_Excel
See Figure 3 : Step1_PlanReview Folder directory structure
Error! Reference source not found.
Sample document for this step: Partners in Flight, 2004. Landbird Conservation Plan. Table 1.

Extract tables from plans and save as Excel files

1. Prepare an Excel file to receive the table by opening Tbl_Plan_Name_Template.xlsx located in \Step1b_Excel and saving it with your conservation plan name.
    a. Open the template and add a blank worksheet for pasting the raw table data from the document.
    b. Use SAVE AS to save the Excel file as Tbl_<Plan_Name>_<Table_Name>.xlsx, where <Table_Name> is the name of the table you are extracting from the source.
        i. Use short names for <Table_Name> like Fig1, Tbl1 or Table1, App1 or Appendix1 (not the whole table name).
        ii. Example: Table 1 from the Partners in Flight Landbird Conservation Plan of 2004 is Tbl_PIF_LandbirdConsPlan_2004_Table1.xlsx
    c. Create an Excel file for each table in each plan (plans may yield more than one).
        i. Example: if you also used Appendix A then make another Excel file and name it Tbl_PIF_LandbirdConsPlan_2004_AppendixA.xlsx.
    d. Instead of using Save As you could copy the template (in windows explorer) and rename it using the same conventions.
2. Use ABBYY FineReader (ABBYY) or Adobe Acrobat Pro to perform Optical Character Recognition (OCR) on the plans from Step 1a: Review and catalog existing conservation and invasive species plans for species, communities and ecosystems and convert the scanned documents to readable text. The OCR happens automatically when you open a .pdf file with ABBYY.
3. Using ABBYY or Adobe Acrobat Pro, extract the tables of interest by selecting and copying the data and save them to an Excel file.
    a. Some entries may be arranged as lists or columns instead of tables or the tables may need to be subdivided. Creating and editing tables can be done in ABBYY and can save you a lot of time. Evaluate the table layout and see if there are any logical places to break up the table or columns.
    b. Save any edits done in ABBYY as <Plan_Name>_ABBYY in the \Step1a_Documents folder. Note that ABBYY documents are stored as directories.
    c. To extract from ABBYY, highlight the table or right-click to “select all” then right-click to copy the data
    d. Paste the data into the Excel file created in Step 1.
    e. Repeat steps c and d as necessary if the table spans multiple pages.
4. If there is more than one table of interest within a single plan, create a new Excel document for each one. (Step 1.c.i)
5. After extracting a table from a plan, update the Plan Metadata database from Step 1a.1 with the <Table_Name>and the name of the Excel file.
    a. Create additional records if more than one table was extracted.
6. If there are no tables to extract, move the file into the appropriate subfolder and note the status in the Plan Metadata database.
    a. DontNeed: the document is not relevant to the project, or is entirely outside Region 8

   b. Supporting: it is an extra document like a budget or implementation plan, or similar.
   c. SpeciesSpecific: the plan addresses a single species, and does not contain a ROC table. The species and the source should be entered in the SpeciesSpecific ROC table.
7. Tables that are already in table format, such as a table on a webpage, a data file available to download from a webpage, or received by email, still need to be converted into the standardized excel format. Save these files in the Step1a_Documents folder, use the same naming conventions and add the table to the Plan Metadata database.

Standardize the extracted tables

Inserting new columns to the table using copy-and-paste from the template will save time. <Project>/Data/ROC_Development\Step1_PlanReview/Step1b_Excel/SpeciesNameFieldNames_Template.xlsx has all of the column names that need to be added to the spreadsheet. The worksheet Tbl_Plan_Name_Template (in the template spreadsheet) also contains all of the fields. Edit the extracted table to match this standard template, and add any fields that are unique to the specific table.

1. Make a copy of the raw data (make a copy of the worksheet before you start editing), so that you don't have to re-select from ABBYY or Adobe if you make a mistake.
2. Remove any extra spaces, page numbers, etc. from the raw table; arrange things so you can read it.
3. Copy the footnotes or other notes to another worksheet to use for documentation
4. Parse information into separate columns using Table 2 below as a guideline.

Table 2: Guidelines for separating values in to columns

Task	Field name	Value	Example
Separate any values that belong in two columns *(Note: sometimes can be done in ABBYY)*	Each new part gets an appropriate name	Each record has the same value as before, but is now in more than one field	**Common Name (*Scientific Name*)** would split into two fields, Common_Name and Scientific_Name. **Common Name** (Endangered) would split into Common_Name and List_Status.
Convert table sub-headings or sections into new fields	Descriptive term that summarizes the section categories, such as "Concern_Level" or "Taxa"	Each record gets its respective sub-heading as the value	Species of Concern table has two sections, Red List Species and Watch List Species. Add a column named "Concern_Level," enter "Red List Species" as the value for the species in that section, enter "Watch List Species" as the value for the species in that section, then remove the subheadings from the table

De-couple any values that are separate concepts, and describe information coded with typeface, colors or asterisk	Descriptive term that summarizes each concept, such as "Watch List Species" or "Concern Level"	Fill in the descriptor for the records that have it. Generally the verbage is in the footnotes.	**Common Name*** where the asterisk indicates federal status should be separated into a column for species name and a column for federal status. ***Scientific Name*** where italics indicate a Watch List species should be separated into a column for species name and a column for concern level.
Identify or create the conservation status field	Consrv_Status or Concern_Level, or similar	This field will have values that show relative rankings of the species, such as Priority Species, T&E status, Watch List levels, etc.	There will generally already be a field in the table that identifies the rank or priority for that particular report. Modify the names to be short and have underscores instead of spaces. If there is not a field, use the table title. For example: **Table 5 Species of Special Concern**. Add the Concern_Level field and designate all of the entries as "Species of Special Concern."

5. Create a lookup table with the levels and an ROC Score, if applicable (sub-headings on tables are most often priority levels, but sometimes not).
6. Rename/Standardize the Species Name fields to be CommonNameVerbatim, ScientificNameVerbatim.

If the table only has scientific names or common names, rename the field that does occur in the original table and add a new field with the missing name. Adding the additional field even if it is empty keeps the tables standardized and makes some of the future steps easier.

Create the CommonNameVerbatimClean and ScientificNameVerbatimClean them with data from CommonNameVerbatim and ScientificNameVerbatim (see Appendix 1: Appendix 1:

7. Data Dictionary, Table 1).
   a. Copy and insert the verbatim columns then add "Clean" to the names (Figure 6) or copy and paste column names from the template.

8. Clean the data as necessary To clean the data, remove punctuation, symbols, subscripts, superscripts, extra spaces and abbreviations for birds, mammals, fish, invertebrates, amphibians and reptiles. (e.g., "ssp." "subsp." or "var."). Leave the abbreviations for plants. Functions and codes for cleaning data can be found on the google document here:

https://docs.google.com/document/d/1QSoqbu57JlJNCTI4SnM6HL3_R-hMtaE4A82HpP1Y0z8/edit

9. Headings often have footnote information. Create a lookup table with the heading original name, the shortened name, footnote number, and the footnote text. Remove the footnote annotation from the final name.

	A	B	C	D	E	F	G	H	I	J
1	Species	Conserv_ Action	Cont_Pop_Ojec tive	Monitoring_ Need	US_Can_Po p_Estimate	Accuracy	Biome_with_Res ponsibility	Concern_Level		
2	Gunnison Sage-Grouse	IM	Increase 100%	**	2,000	5	Intermountain W	Watch List Species—Multiple causes		
3	Lesser Prairie-Chicken	IM	Increase 100%	**	32,000	5	Prairie	Watch List Species—Multiple causes		
4	California Condor	IM	Recovery Plan	**	< 100	6	Pacific	Watch List Species—Multiple causes		
5	Green Parakeet	IM	Increase 50%	Mo1	< 5,000	1	*	Watch List Species—Multiple causes		
6	Thick-billed Parrot	IM	Poss. Reintroduc	Mo1	0 ?	6	Southwest	Watch List Species—Multiple causes		
7	Red-crowned Parrot	IM	Increase 100%	Mo1	< 2,500	2	*	Watch List Species—Multiple causes		
8	Red-cockaded Woodpecker	IM	Recovery Plan	Mo2	20,000	2 D	Eastern	Watch List Species—Multiple causes		
9	Ivory-billed Woodpecker	IM	Locate	**	0 ?	6	Eastern	Watch List Species—Multiple causes		
10	Black-capped Vireo	IM	Recovery Plan	Mo1	4,800	4	Southwest	Watch List Species—Multiple causes		
11	Florida Scrub-Jay	IM	Recovery Plan	**	10,000	5	Eastern	Watch List Species—Multiple causes		
12	Island Scrub-Jay	IM	Maintain/Increa	Mo1	9,000	5	Pacific	Watch List Species—Multiple causes		
13	Bicknell's Thrush	IM	Maintain/Increa	**	40,000	4	Northern Forest	Watch List Species—Multiple causes		

Figure 5 : Heading names shortened, spaces and footnotes removed

10. Duplicate the Table1 worksheet (Figure 5). **Add the rest of the standard field names. Refer to the blank template worksheet the columns with standard field names (see Appendix 1: Appendix 1:** GenusSpeciesClean, GenusSpeciesSspClean, CommonNameITIS, ScientificNameITIS, GenusSpeciesITIS, GenusSpeciesSspITIS, TSN, Source_Reference, Source_TableName, ROCScore

	A	B	C	D	E	F	G	H
1	CommonNameVerbatim	ScientificNameVerbatim	CommonNameVerbatimClean	ScientificNameVerbatimClean	GenusSpeciesClean	GenusSpeciesSspClean	CommonNameITIS	ScientificNameITIS
2	Gunnison Sage-Grouse		Gunnison Sage-Grouse					
3	Lesser Prairie-Chicken		Lesser Prairie-Chicken					
4	California Condor		California Condor					
5	Green Parakeet		Green Parakeet					
6	Thick-billed Parrot		Thick-billed Parrot					
7	Red-crowned Parrot		Red-crowned Parrot					
8	Red-cockaded Woodpecker		Red-cockaded Woodpecker					
9	Ivory-billed Woodpecker		Ivory-billed Woodpecker					
10	Black-capped Vireo		Black-capped Vireo					
11	Florida Scrub-Jay		Florida Scrub-Jay					
12	Island Scrub-Jay		Island Scrub-Jay					
13	Bicknell's Thrush		Bicknell's Thrush					
14	Bachman's Warbler		Bachman's Warbler					
15	Golden-winged Warbler		Golden-winged Warbler					
16	Colima Warbler		Colima Warbler					
17	Golden-cheeked Warbler		Golden-cheeked Warbler					
18	Kirtland's Warbler		Kirtland's Warbler					
19	Bachman's Sparrow		Bachman's Sparrow					
20	Henslow's Sparrow		Henslow's Sparrow					
21	Saltmarsh Sharp-tailed Sparrow		Saltmarsh Sharp-tailed Sparrow					

Tbl_Plan_Name_Template | Table1 | heading_lut | ROC_Categories | Table1raw

Ready 100%

Figure 6 : Table after all standard fields added

11. Enter the bibliographic information for the source in the Source_Reference field, and the table name in the Source_TableName field. Autofill for all the records in the table. (Note: make sure you select copy cells and not fill series in the autofill dropdown, so the source date does not increment.)

12. Create lookup tables for any fields that have abbreviations, to the extent that the fields seem important or will be used.
    a. Use a pivot table to find the unique values, or create them later in Access using queries as described in Step 1c.4.
13. Update the Plan Metadata to indicate the table has been cleaned in Excel. Note any significant problems, questions, or important details, if applicable.

Step 1c: Create an Access database of conservation and invasive species plan tables

Working directory for this Step:
<Project>\Data\ROC_Development\Step1_PlanReview\Step1c_Access
Sample document for this step: Partners in Flight, 2004. Landbird Conservation Plan. Table 1.

Note: for this section of the documentation we will use a generic name "<ConsTable>" to represent the excel tables. When the process is applied the "<ConsTable>" will need to follow the table naming conventions etc.

WARNING: All Tables should have an AutoNumber ID field added to the table. If a table does not have an AutoNumber ID field the scripts at the end will fail.

1. Rename the Master ROC Set (Master_Plan_Database.accdb) from

   Renaming the database provides documentation about which database was used for the specific NRMP that the ROC table is developed for.

   <Project>\Data\ROC_TableDevelopment\Step1_PlanReview\Step1c_Access. Follow the naming convention <LIT>_Plan_Table.accdb. This is the Plan ROC Set (<Plan_ROC_Set>.

2. Import the Excel tables (i.e. <ConsTable>) into the access database.
   a. During the import, select "long integer" as the type for TSN and ROCScore.
   b. Let Access Add a Primary Key. **All tables must have an auto number ID field.**

   c. Name the table the same as the Excel file, and add "_D" to the end of the main data table.
   d. Also import any lookup tables already created, like heading descriptions or other codes. Add "L" to the end of the look up tables.
3. For each <ConsTable> run an Update Query to populate: GenusSpeciesClean and GenusSpeciesSspClean
4. For each <ConsTable>, create a lookup table (L) for the conservation value codes (if you did not already make it in Excel) and back-populate the original table with the full description.
   a. Run a Make Table Query using "group" to create code look-up tables (LUT) for each of the conservation codes. Name the resulting table: Tbl_<ConsTable>_<OringialFieldName>_L
   b. Open the new LUT, add a field for description: <OringialFieldName>_Desc.
   c. Write out the full text for the code (e.g., replace codes such as "FE" with "Federally Endangered").
   d. Add a new field in the <ConsTable> for the code description. Use the same name as in the LUT: <OringialFieldName>_Desc
   e. Join the <ConsTable> to the LUT (join on <OriginalFieldName>). Run an Update Query to populate the <OriginalFieldName>_Desc field in the <ConsTable> with the full text for the code from the LUT.
   f. Example: Our document <ConsTable> = Tbl_PIF_LandbirdConsPlan_2004_Table1. The <OringialFieldName> is Concern_Level. The LUT we create is called Tbl_PIF_LandbirdConsPlan_2004_Table1_ConcernLevel_LUT. Add a field to both the original table and the lookup table called Concern_Level_Desc. Fill out the descriptions in the LUT, join the LUT to the <ConsTable>, then update the Concern_Level_Desc field in the <ConsTable>.
5. Update the Plan Metadata to record which tables were imported, their names, and the name of the database.
6. After a table has been imported and is complete, move the corresponding Excel files and plan Documents into the "Complete" subfolder in their respective folders.

Integrated Taxonomic Information System (ITIS) Name Standardization

Note: The ITIS names will need to be updated in the cross-walk tables and the conservation tables so they all meet the same standard. As more of our species names meet the ITIS standard this will become easier and it can be automated.

Working directory for this Step:
<Project>\Data\ROC_Development\Step1_PlanReview\Step1c_Access
Sample document for this step: California Department of Fish and Wildlife, 2008. Bird Species of Special Concern. Table 1.
<Plan_ROC_Set>: HMB_Plan_Table.accdb
<Plan_Name> CDFW_BirdSppOfSpecCon_2008.pdf
<ConsTable> Tbl_CDFW_BSSC_2008_Table1
Sample ITIS taxon table <SpeciesList>: <Taxon>SpeciesUnique

NOTE: the following section is assuming that the refuge species list has been standardized to the IT IS naming standard and that the crosswalk table between existing refuge species names and IT IS valid names is available. If that is not the case, the conservation plan names can be standardized to ITIS using the ITIS.gov website tools, R scripts or other methods for standardization of names.

1. Import the ITIS taxon table from Z:\I_M\Projects\Species_Occurence\R8_Project\Data\List2015\R8_SpeciesLists.accdb - BirdSpeciesUnique. This is the <SpeciesList> table.
2. Run a series of Update Queries to populate the following fields in the <ConsTable> using the corresponding fields in the <SpeciesList> table:
    - CommonNameITIS,
    - ScientificNameITIS,
    - GenusSpeciesITIS, - Note: separating out genus / species and subspecies allows users to identify species on refuges lists and conservation lists that may connect on species or on subspecies. This just allows for more flexibility in the final ROC calculations. The process is the same for populating these fields as the ScientificNameITIS field. The following queries do not describe the species subspecies population process.
    - GenusSpeciesSspITIS
    - TSN
3. Reference Table 3 for a description of which fields to use to join the tables and under what conditions.

ALWAYS SET THE CRITERIA FOR "ScientificNameITIS" TO "Is Null."

Table 3: Fields to join between the Conservation Table and the ITIS taxon table under various conditions

Condition	<ConsTable> field	<SpeciesList> Field	Figure #
New table with latest version of species list (first run)	ScientificNameVerbatimClean	ScientificNameITIS	Figure 7
Scientific Name did not have a match in ITIS during the first run.	ScientificNameVerbatimClean	ScientificNameVerbatimClean	Figure 8
Only Common Names available	CommonNameVerbatimClean	CommonNameITIS	Figure 9
Common Name did not have a match in ITIS	CommonNameVerbatimClean	CommonNameVerbatimClean	Figure 10

***Be Very Careful** using Common Name crosswalks because the common name for the species may join to a subspecies or vice versa.*

4. Save the ITIS crosswalk query as Qry_<ConsTable>_ITIS. (You may abbreviate the <ConsTable> name if there is something obvious that makes sense.)
5. Update the Plan Metadata to document your progress.

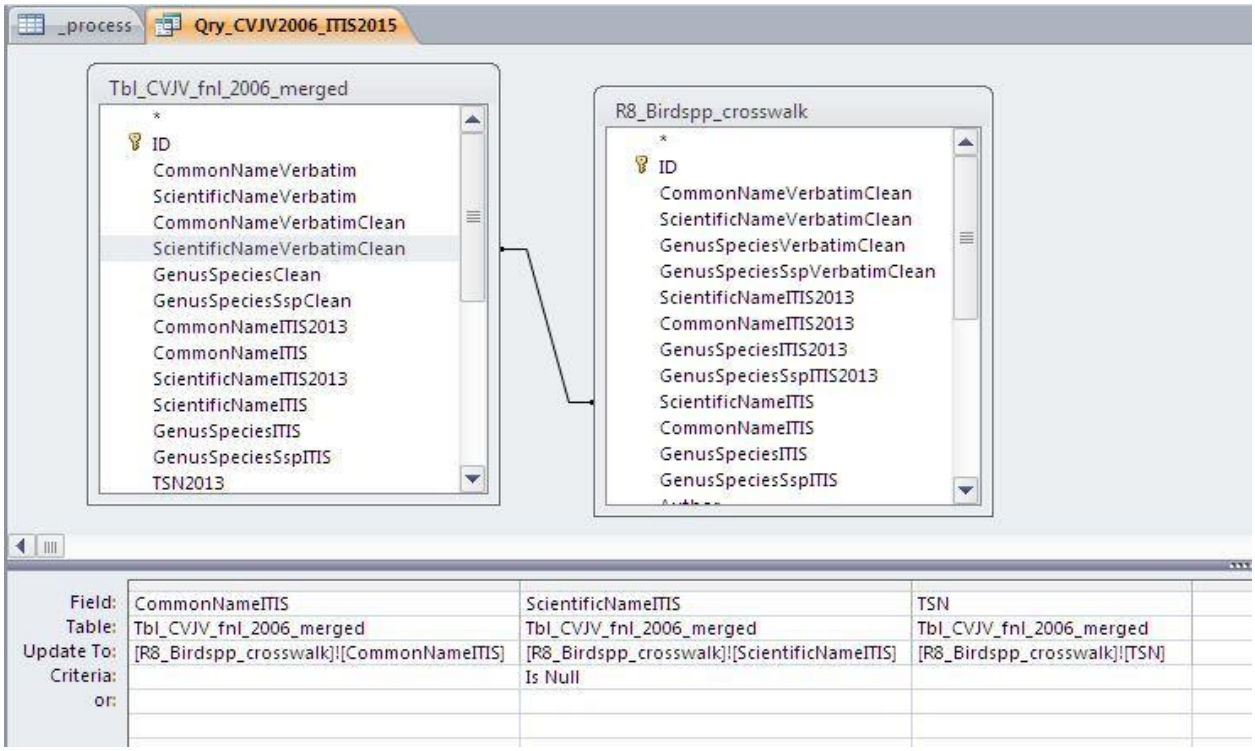


Figure 7: ScientificNameVerbatimClean to ScientificNameITIS

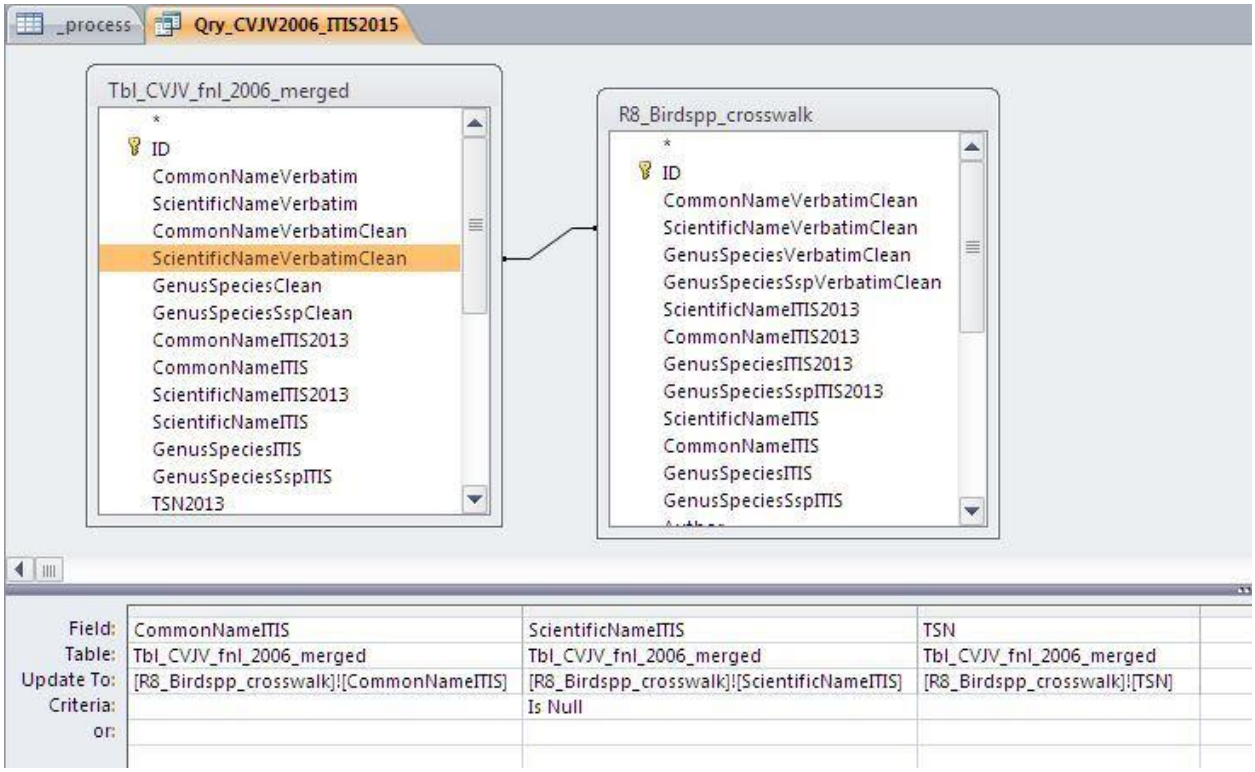


Figure 8: ScientificNameVerbatimClean to ScientificNameVerbatimClean

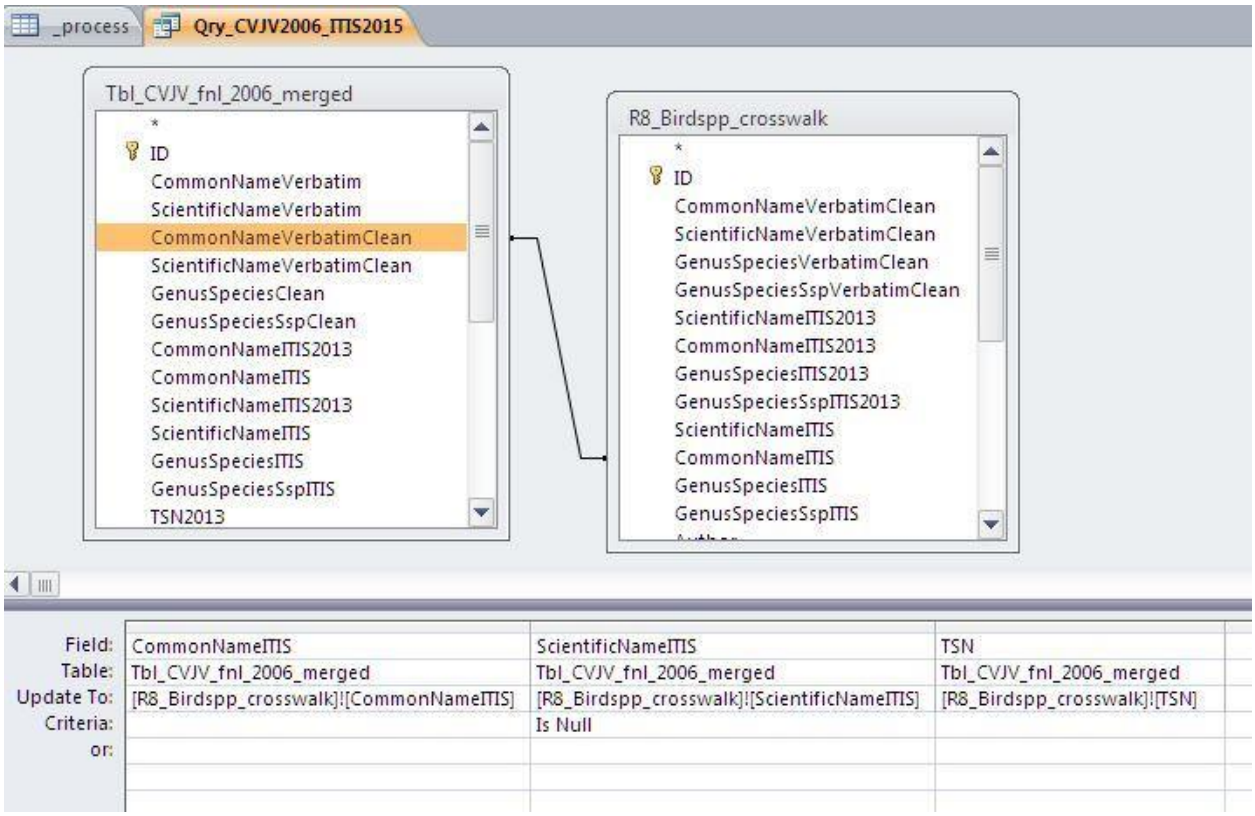


Figure 9: CommonNameVerbatimClean to CommonNameITIS

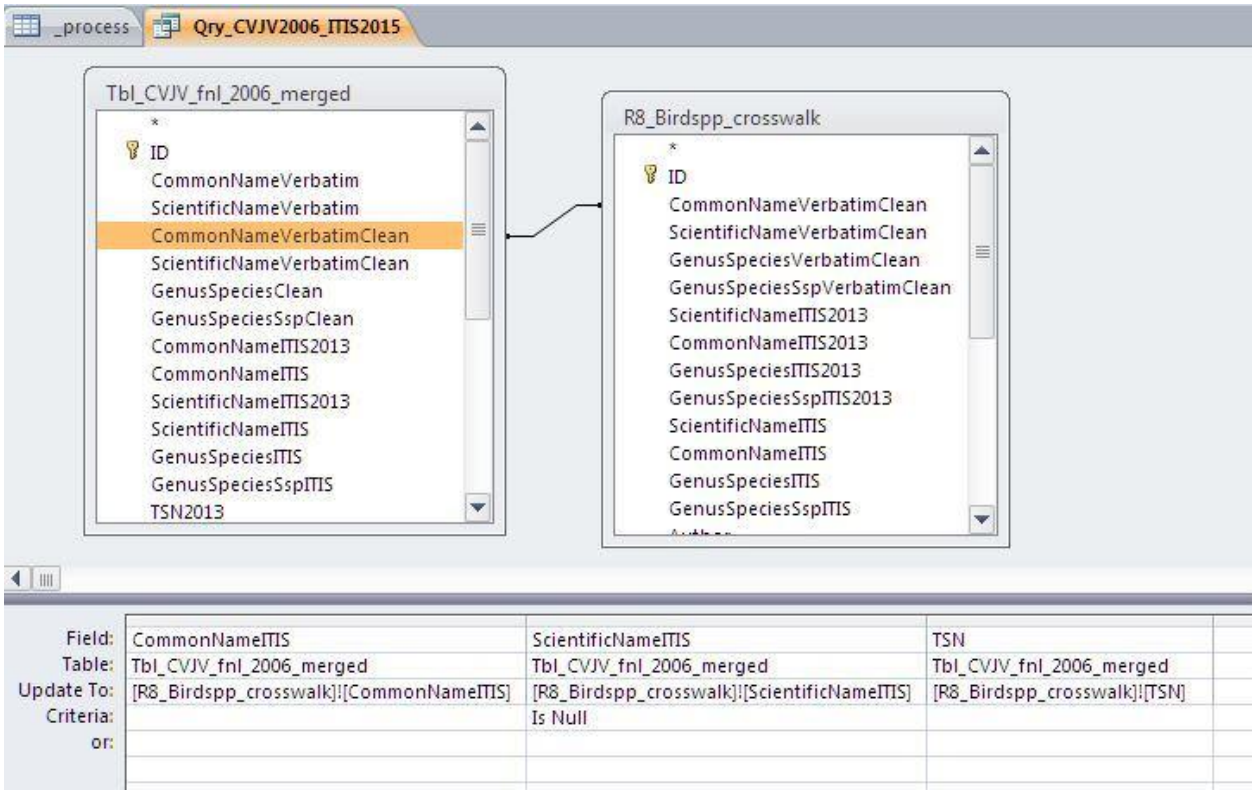


Figure 10: CommonNameVerbatimClean to CommonNameVerbatimClean

Special Case: Updating 2013 ITIS tables with 2015 ITIS tables

Note: Taxonomy is always a moving target. In order for the queries to work, all of the scientific names need to meet the same version of ITIS. The some of the conservation tables and refuge species lists were standardized to IT IS in 2013. When we added new conservation tables in 2015 all of the tables and refuge species lists needed to be updated to 2015 ITIS. The following describes a method for handling this standardization. This needs to be automated in the future.

1. Add 2015 fields for CommonNameITIS, ScientificNameITIS, and TSN to the <ConsTable>. Write 2015 in the field desciption. See Figure 11.
2. Rename the old fields by adding 2013 to the end. See Figure 11.
3. Organize the fields so they are adjacent and easier to see. See Figure 11.

Tbl_CDFW_BSSC_2008_Table1_BirdSppOfSpecCon | Qry_CDFW_BSSC_Table1_ITIS2015 | Qry_CDFW_BSSC_Table1_unmatched

Field Name	Data Type	
ID	AutoNumber	
CommonNameOriginal	Text	
ScientificNameOriginal	Text	
CommonNameOriginalClean	Text	
ScientificNameOriginalClean	Text	
GenusSpeciesClean	Text	
GenusSpeciesSspClean	Text	
CommonNameITIS2013	Text	
CommonNameITIS	Text	2015
ScientificNameITIS2013	Text	
ScientificNameITIS	Text	2015
GenusSpeciesITIS	Text	
GenusSpeciesSspITIS	Text	
TSN2013	Number	
TSN	Number	2015
Source_Reference	Memo	
Source_TableName	Text	

Figure 11: Adding 2015 ITIS fields to revise 2013 ITIS fields

4. Run a series of Update Queries to populate the CommonNameITIS, ScientificNameITIS, GenusSpeciesITIS, GenusSpeciesSspITIS, and TSN in the <ConsTable> using the corresponding fields in the <SpeciesList> table. Reference Table 4 for the description of joins and criteria

ALWAYS SET THE CRITERIA FOR "ScientificNameITIS" TO "Is Null."

Table 4: Fields to join when updating 2013 ITIS fields

Condition	<ConsTable> field	<SpeciesList> Field	Figure #
2013 values previously populated. Fill in the 2015 column with updated values.	ScientificNameITIS2013	ScientificNameITIS2013	Figure 12

2013 Values have been updated but there are still records with no ITIS match	ScientificNameVerbatimClean	ScientificNameITIS

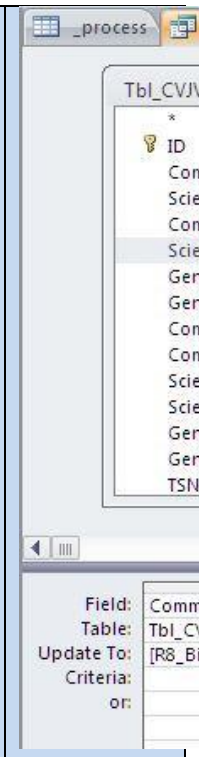


Figure 7

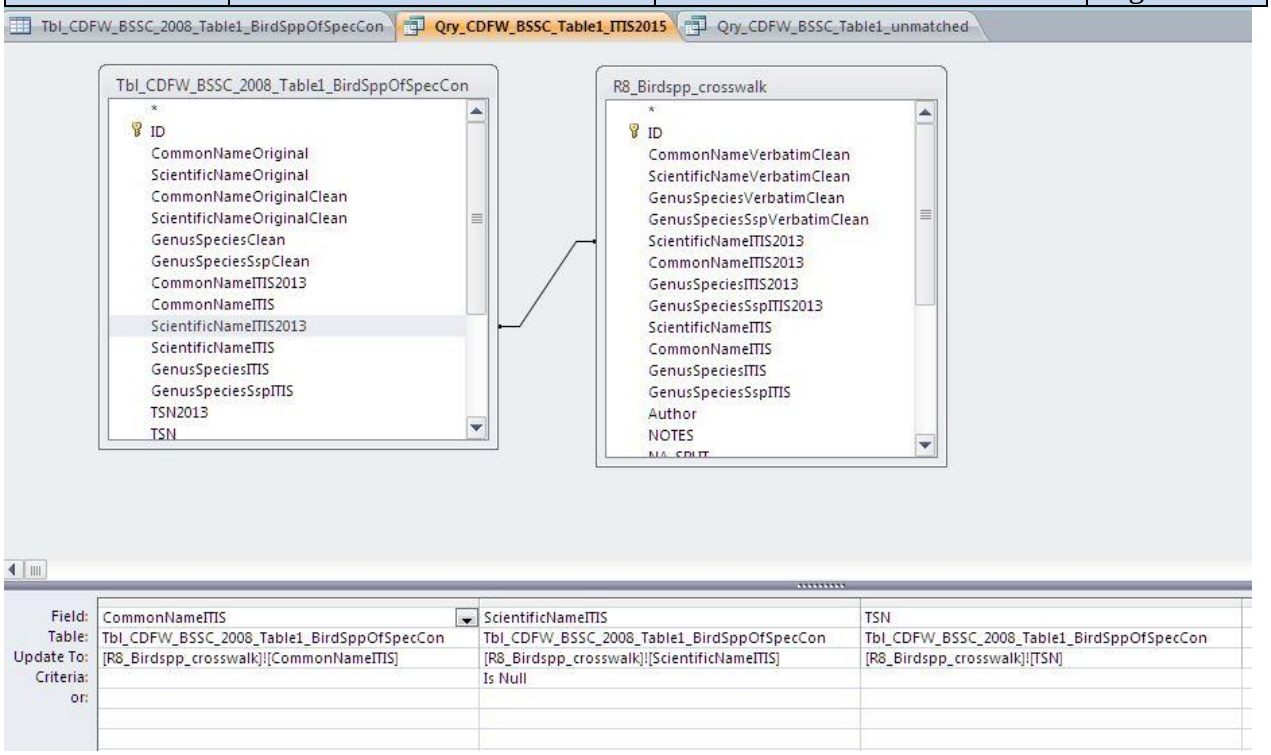


Figure 12: Join ScientificNameITIS2013 to ScientificNameITIS2013

Cleaning records that do not have a match in ITIS

1. Run Make Table query using "group" to create a table of records that did not have a name match in ITIS. These are called "unmatched records."
    a. Include the following fields in the table:
        - Source
        - CommonNameVerbatimClean
        - ScientificNameVerbatimClean
        - GenusSpeciesClean
        - GenusSpeciesSspClean
        - CommonNameITIS
        - ScientificNameITIS
        - GenusSpeciesITIS
        - GenusSpeciesSspITIS
        - TSN
        - ITISNotes
    b. Criteria: "ScientificNameITIS" Is Null ,
    c. Table Naming Convention: <Taxon>NameToClean
2. Each subsequent run (there will be a run for every <ConsTable> with unmatched records), change Step 1 to an Append Query and append new records to the <Taxon>NameToClean table
3. Once all of the "unmatched" names are identified from the conservation tables, follow the procedure outlined in "Step 2: Integrated Taxonomic Information System (ITIS) Name Standardization," and create an updated ITIS taxon table.
4. Store the updated taxon table here: Z:\I_M\Projects\Species_Occurence\R8_Project\Data\List2015\NamesToClean.accdb.
5. Import the Z:\I_M\Projects\Species_Occurence\R8_Project\Data ITIS taxon table back into the <Plan_ROC_Set> (<LIT>_Plan_Table.accdb) and repeat the instructions in Step 1c, under the section "Integrated Taxonomic Information System (ITIS) Name " until all names have been standardized to ITIS. (make sure the ITISNotes field is updated in the query)

Step 2: Populate species, community and ecosystem occurrence tables

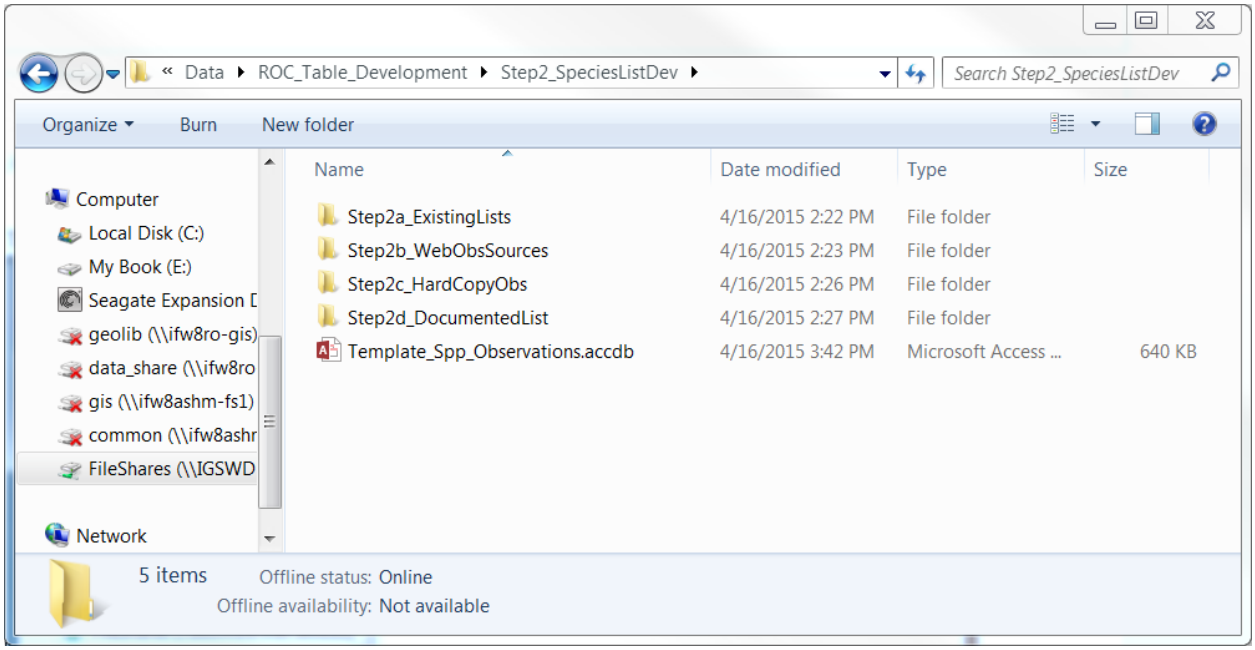
In this step you will compile tables of species occurrences from various sources to use to compare with the species in the Resource of Concern Tables.

Step 2a: Compile existing species lists (CCPs/websites)

Create Refuge-specific species lists based on Coordinated Conservation Plans.

Working Directory for this Step:
<Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2a_ExistingLists

Templates: Template_Spp_Observations.accdb, SppList_Metadata_Template.xlsx



This step has been completed for CCP/Websites for many of the R8 refuges. Check existing Species list for the refuge, then either import the list or create a new one.

Add lists to the Species Observation Database

1. Copy the Species Observation Template (Template_Spp_Observations.accdb) from **Step2_SpeciesListDev** folder to the **Step2a_ExistingList** folder.
    a. Naming convention: **<LIT>_SpeciesList.accdb**.
    b. This is the starting point for the Species Observation Database
    2. Check Z:\I_M\Projects\Species_Occurence\R8_Project\Data\Lists2015\R8 R8_SpeciesLists.accdb to identify existing "clean" lists.
3. If CCP/Website lists have been cleaned:
    a. Import the existing lists from Z:\I_M\Projects\Species_Occurence\R8_Project\Data into the Species Observation Database (<LIT>_<Taxon>_List.accdb).
        i. Use the naming convention **Tbl_<LIT>Spp_<Taxon>** or if you want to work with all the species in the same table Tbl_<LIT>SppList
        ii. Each table is a Species Observation List (<ObsList>)
4. If CCP/Website lists have not been cleaned, follow these steps to create a list for each file or list that has not been cleaned:
    a. Open <LIT>_SpeciesList.accdb. For each taxa that does not already exist and has a list to be cleaned, make a copy of Tbl_Spp_Observation
        i. Use the naming convention **Tbl_<LIT>Spp_<Taxon>**
        ii. Each table is a Species Observation List (<ObsList>).

Note: Some CCP/Website lists will be appended to existing lists imported from Z:\I_M\Projects\Species_Occurence\R8_Project\Data, some lists will require new taxa tables. The cleanup process is the same.

b. Begin a tracking spreadsheet for the files and tables (do this for the first instance):
    i. Rename the Metadata_Template.xlsx in the Step2_SpeciesListDev folder using the convention <LIT>_SppList_Metadata.xlsx
c. Copy CCP/Website sources of species lists into the Step2a_ExistingLists folder.
d. Create an Excel file to receive the data from the source (make a spreadsheet for each source):
    i. Copy the SpeciesListName_Template.xlsx file from the Step2a_ExistingLists folder to the same folder and name it according to the convention: "<LIT>_<Taxon>_<Source>_<ExcelFileDate>.xlsx" (for example: "ANH_Bird_CCP_20130801.xlsx").
e. Using ABBYY FineReader, extract the table of interest from the source and save it to the spreadsheet (<LIT>_<Taxon>_<Source>_<ExcelFileDate>.xlsx).
    i. Each source gets its own spreadsheet and some sources may have multiple tables.
    ii. After extracting a table from the CCP/Website or other refuge documents, update the metadata.

Standardize the Species Name columns in the spreadsheet (<LIT>_<Taxon>_<Source>_<ExcelFileDate>.xlsx). Follow the convention in the Spp_Table in the Template_Spp_Observations.accdb database, or see Appendix 1: Appendix 1:

i. Data Dictionary, Table 1:
    i. Rename the species name fields: CommonNameVerbatim, ScientificNameVerbatim.

If the table only has scientific names or common names, rename the field that does occur in the original table and add a new field with the missing name. Adding the additional field even if it is empty keeps the tables standardized and makes some of the future steps easier.

Add the standard fields described in the Appendix 1: Appendix 1:

ii. Data Dictionary, Table 1:
- Source_Reference
- Source_TableName
- CommonNameVerbatimClean
- ScientificNameVerbatimClean
- GenusSpeciesClean
- GenusSpeciesSspClean
- CommonNameITIS
- ScientificNameITIS

- GenusSpeciesITIS
- GenusSpeciesSspITIS
- TSN
- ITISNotes

Populate: CommonNameVerbatimClean and ScientificNameVerbatimClean with ScientificNameVerbatimClean with cleaned-up data from CommonNameVerbatim and ScientificNameVerbatim (see Appendix 1: Appendix 1:

iii. "Data Dictionary, Table 1). To clean the data, remove punctuation, symbols, subscripts, superscripts, extra spaces and abbreviations for birds, mammals, invertebrates, reptiles and amphibians (e.g., "ssp." "subsp." or "var."). Keep the abbreviations for plants. Functions and codes for cleaning data can be found on the R8 I&M google document here: https://docs.google.com/document/d/1QSoqbu57JlJNCTI4SnM6HL3_R-hMtaE4A82HpP1Y0z8/edit.

iv. Update the metadata table <LIT>_SppList_Metadata.xlsx to track if a table has been cleaned in excel and access

g. Import the excel tables into the Species Observation Database (<LIT>_SpeciesList.accdb).
   i. Name the tables: Tbl_<Taxon>_<Source>_<ExcelFileDate>.

h. Append each new source to the appropriate Observation List (Tbl_<LIT>Spp_<Taxon> or to the single all taxon table Tbl_<LIT>SpeciesList).

5. Update the metadata spreadsheet

Integrated Taxonomic Information System (ITIS) Name Standardization - This section will be modified as more scripts and tools are developed.

The following chart (Figure 13) illustrates the process for cleaning the species lists and updating the master ITIS species table.

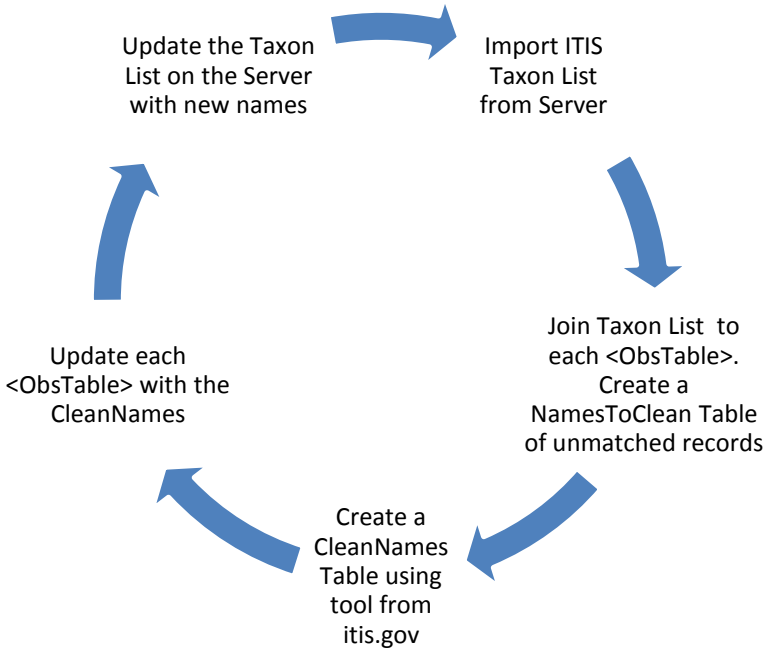


Figure 13

1. Perform ITIS Name Standardization
    a. Import the ITIS taxon table into the Species Observation Database (<LIT_<Taxon>_List.accdb or <LIT>_SpeciesList.accdb) from Z:\I_M\Projects\Species_Occurence\R8_Project\Data.
        i. Use the naming convention: **<Taxon>SpeciesUnique**.
        ii. This is the **ITIS list**.
    b. Join the Species Observation List (Tbl_<LIT>Spp_<Taxon>) to the ITIS list (<Taxon>SpeciesUnique) as described in Table 5.
    c. Run an Update Query to populate the following fields in the Species Observation List (<ObsList>) with values from the ITIS list:
        - CommonNameITIS
        - ScientificNameITIS
        - GenusSpeciesITIS
        - GenusSpeciesSspITIS
        - TSN.
        - ITISNotes

ALWAYS SET THE CRITERIA FOR "ScientificNameITIS" TO "Is Null."

Table 5: Fields to Join When Updating Species Observation Lists with ITIS information

Condition	<ObsList> field	<Taxon> SpeciesUnique Field	Figure #
No previous update queries (first run)	ScientificNameVerbatimClean	ScientificNameITIS	Figure 7
Records with no match during the first run	ScientificNameVerbatimClean	ScientificNameVerbatimClean	Figure 8

2. Find any records in the Species Observation List (<ObsList>) that did not have a match in the ITIS list (<Taxon>SpeciesUnique)
    a. Run Make Table query using "group" to create a table of records to clean.
        i. Fields to group:
            - Source
            - CommonNameVerbatimClean
            - ScientificNameVerbatimClean
            - GenusSpeciesClean
            - GenusSpeciesSspClean
            - CommonNameITIS
            - ScientificNameITIS
            - GenusSpeciesITIS
            - GenusSpeciesSspITIS
            - TSN.
            - ITISNotes
        ii. Criteria:"ScientificNameITIS" Is Null
        iii. Output table naming convention: <Taxon>NameToClean
        iv. This is the **Names to Clean** table
    b. Repeat Step a for each Species Observation List (<ObsList>) but change the query type to and Append Query
        i. Append new records to the <Taxon>NameToClean table
3. Once all of the "unmatched" names are identified from the Species Observation Lists, use the *ITIS compare names tool* from itis.gov to find matches and create a Clean Names <CleanNames> table. Save the files for this step in the Step2a_ExistingList folder.
    a. Export the unmatched names (<Taxon>NameToClean) from the Species Observation database as a .txt file, the field name should be renamed to "Name"
        i. File name: <Taxon>NameToClean_<YYYMMDD>.txt
    b. Use the *ITIS compare names tool* to submit the text file.

c. Copy and Paste the resulting list of valid and invalid names from the web page to an excel file. (Figure 14)

	A	B	C	D	E	F	G	H
1	TSN	Scientific Name	Author	Rank Name	Credibility	Name Usage	Accepted TSN	Accepted Name
2	179241	Acanthis flammea	(Linnaeus, 1758)	Species	Reviewed	invalid	179230	Carduelis flammea
3	175214	Alopochen aegyptiaca	(Linnaeus, 1766)	Species	Reviewed	valid		
4	554925	Amazona finschi	(P. L. Sclater, 1864)	Species	Reviewed	valid		
5	177800	Amazona ochrocephala	(Gmelin, 1788)	Species	Reviewed	valid		
6	554926	Amazona oratrix	Ridgway, 1887	Species	Reviewed	valid		
7	175028	Anser anser	(Linnaeus, 1758)	Species	Reviewed	valid		
8	175032	Anser cygnoides	(Linnaeus, 1758)	Species	Reviewed	valid		
9	175034	Anser indicus	(Latham, 1790)	Species	Reviewed	valid		
10	177815	Cacatua galerita	(Latham, 1790)	Species	Reviewed	valid		
11	558992	Calocitta colliei	(Vigors, 1829)	Species	Reviewed	valid		
12	177697	Cyanoliseus patagonus	(Vieillot, 1818)	Species	Reviewed	valid		
13	175667	Milvago chimachima	(Vieillot, 1816)	Species	Reviewed	valid		
14	177497	Nymphicus hollandicus	(Kerr, 1792)	Species	Reviewed	valid		
15	562025	Phoenicopterus chilensis	Molina, 1782	Species	Reviewed	valid		
16	562027	Phoenicopterus minor	E. Geoffroy Saint-Hilaire, 1798	Species	Reviewed	invalid	174978	Phoeniconaias minor
17		Psarocolius						

Figure 14: Example of output from IT IS.gov compare names tool

i. File name: <Taxon>CleanNames_<YYYYMMDD>.xlsx

d. Import the Excel file back into the Species Observation database.

i. Table name:<Taxon>CleanNames<YYYYMMDD>

ii. This is the **Clean Names <CleanNames>** table.

e. There will be a hidden character which behaves like a "space." To remove the hidden character from all of the fields in the table:

i. Select the character

ii. Copy it into the "search" and "replace" tool. Search for the character and replace it with nothing. Replace all in the document.

4. Update the records in the Names to Clean table with the Clean Names table (Figure 15).

Note: The Names to Clean will then be used to update both the Species Observation Lists (<ObsList>) and the ITIS list on the server (<SpeciesList>).

a. Create an Update Query and Join the Clean Names table to the Names to Clean table (<Taxon>NameToClean).
    i. Join field: Scientific Name
    ii. Fields to update:
        - ScientificNameITIS,
        - TSN and
        - Author

The Clean Names table will have a "Name Usage" field that indicates if a name is valid or not (valid/invalid for animals, accepted/not accepted for plants). If the name is valid/accepted, then use the name for the update. If the name is invalid/not accepted, then use the alternate name for the update. **This is a two part query.**

b. Update the valid/accepted names
    i. Set criteria for "Name Usage" field to "valid" (animals) or "accepted" (plants)
    ii. Map ScientificNameITIS to Name, TSN to TSN and Author to Author.
c. Update the invalid/not accepted names
    i. Set criteria for "Name Usage" field to "invalid" (animals) or "not accepted" (plants)
    ii. Set criteria for "ScientificNameITIS" field to "is null"
    iii. Map ScientificNameITIS to Accepted Name, and TSN to Accepted TSN. To get the accepted author the data will need to be rerun through the ITIS.gov compare names tool.

Note: Plants are a special case and all of the "unaccepted" names need to be reviewed to determine how any taxonomic splits have happened and if one name/author combination should be selected over another. Edit the "clean" names table before doing the update to make sure the correct names are selected during the join.

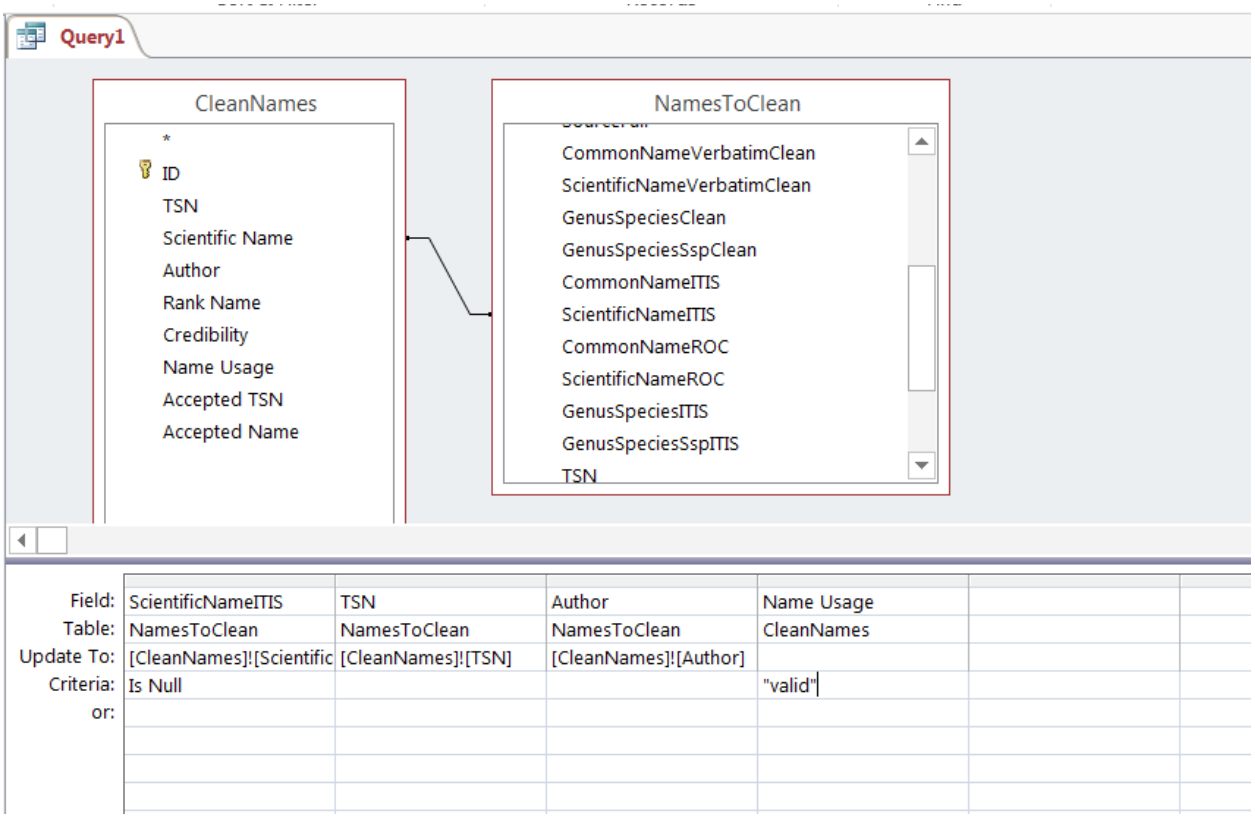


Figure 15: Query to update ScientificNameITIS with valid ITIS names

5. Investigate any entries in Names to Clean (<Taxon>NameToClean) that are still blank after updating from <CleanNames>. Visit the ITIS website or other taxonomic standard that can help figure out synonomy. If a ITIS name can be found cut and paste in the scientific names. If not fill out the ITISnotes field with an indication of when the ITIS search was done.
6. When the <Taxon>NameToClean table has been updated with valid names, Update the Species Observation List (<ObsList>) using the <Taxon>NameToClean list.
    a. Follow the instructions from item 1 of "Integrated Taxonomic Information System (ITIS) Name Standardization," but join the <Taxon>NameToClean table to the <ObsList> to do the update.
    b. Revise the <Taxon>NameToClean table or the <ObsList> as necessary if there are still unmatched records.

7. Append the new and cleaned species names from the <Taxon>NameToClean table.to the ITIS taxon table on Z:\I_M\Projects\Species_Occurence\R8_Project\Data\R8_SpeciesLists.accdb crosswalk tables to create a revised master list of species names.
8. To have a field to connect to all of the conservation tables and refuges species lists a ScientificNameROC and CommonNameROC field is added to all of the tables. Once all of the names have been standardized update the ScientificNameROC first with all of the ITIS names and

then with the ScientificNameVerbatimClean for any names not in ITIS. Repeat the process for CommonNameROC.

Step 2b: Compiling observation data from online sources

Working Directory for the Step:
<Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2b_WebObsSources

Compiling Online Data

1. Copy the Species Observation Template (**Template_Spp_Observations.accdb**) from **Step2_SpeciesListDev** folder to the **Step2b_WebObsSources** folder.
    a. Naming convention: **<LIT>_<Taxon>_ObservationsWeb.accdb**.
    b. This is the **Web Observation Database**
2. Check Z:\I_M\Projects\Species_Occurence\R8_Project\Data to determine if AKN and BISON data have recently been compiled for the refuge.
    a. If data is available
        i. Import the available AKN and BISON tables into the Web Observation Database (<LIT>_<Taxon>_ObservationsWeb.accdb)
            1. Use the naming convention: Tbl_<LIT>_Spp<Taxon>_<Source>.
        ii. Rename the Tbl_Spp_Observations to **Tbl_Spp<Taxon>_ObservationsWeb**.
            1. This is the **web list <WebList>**
        iii. Check the AKN and BISON tables and make sure there is a "source" field or a field with the source that can be cross-walked to the standard "source" field.
        iv. Use Append query to compile the AKN and BISON data into Tbl_Spp<Taxon>_ObservationsWeb.

        Note: incoming species names from the AKN/BISON datasets will be cross-walked to the standard field names during the append query.
        v. Fill out the metadata table to track which tables came from which source etc.
    b. If the AKN/BISON data has not been generated for the area recently
        i. Request new AKN files from the AKN website. It is recommended to download the data by county because the State files can be very large and do not always download completely. There is no indication when the file only partially downloads.
        ii. Download the files
        iii. Locate the AKN_Select.R script in the <Project>\Data\ROC_TableDevelopment\Step2_SpeciesListDev\Step2b_WebObsSources folder and rename it to AKN_Select_<LIT>.R
        iv. Edit AKN_Select_<LIT>.R to target the correct AKN files. See the documentation in the script to identify what needs to be edited. The AKN data. The AKN county files corresponding to the refuge of interest will need to be identified in the script.
        v. Run AKN_Select_<LIT>.R

vi. Locate the AKNSummary.R script in the <Project>\Data\ROC_TableDevelopment\Step2_SpeciesListDev\Step2b_WebObsSources folder and rename it to AKNSummary_<LIT>.R

vii. Run AKNSummary_<LIT>.R.

viii. Import the resulting AKN Summary table into the <LIT_<Taxon>_ObservationsWeb.accdb.

ix. Locate the BISON_PointPoly.R script in the <Project>\Data\ROC_TableDevelopment\Step2_SpeciesListDev\Step2b_WebObsSources folder and rename it to BISON_PointPoly_<LIT>.R

x. Run BISON_PointPoly_<LIT>.R to select BISON data for the refuge.

1. You'll need to provide a refuge boundary to reduce the selected area.
2. There are also some refuge bounding coordinates in the script that would need to be updated. See the documentation in the script for further details of what needs to be edited.

xi. Locate the BISONSummary.R script in the <Project>\Data\ROC_TableDevelopment\Step2_SpeciesListDev\Step2b_WebObsSources folder and rename it to BISONSummary_<LIT>.R

3. Run BISONSummary<LIT>.R to summarize the data from BISON_PointPoly<LIT>.R

i. Import the BISON summary table into <LIT>_<Taxon>_ObservationsWeb.accdb

1. Name the tables Tbl_<LIT>_Spp<Taxon>_<Source>.

ii. Follow Step a above to append the sources to the Web List (Tbl_Spp<Taxon>_ObservationsWeb)

4. If the refuge decides to do a more intensive documentation process:

a. Identify online species/community/ecosystem occurrence data sources such as museum records, Avian Knowledge Network (AKN), Biodiversity Information Serving Our Nation (BISON), California Natural Diversity Database (CNDDB), Nevada Natural Heritage Program (NNHP), etc. that have potential occurrence data for the refuge.

Note: the natural diversity databases are used for two different purposes. The first is as a "conservation plan" this aspect helps us identify the different status of species in each state. The second is as an observation of a species on the refuge.

b. Catalog these data sources in the Region 8 Catalog of Online Resources spreadsheet: https://docs.google.com/a/fws.gov/spreadsheet/ccc?key=0AqPE_Snh6YzRdDh3U2luRUpSRVBQRThpN0ZVMlpYUEE#gid=0. This single spreadsheet is maintained for all refuges and is updated with each NRMP.

c. Query the online sources for data that occurs within the refuge boundaries (using the"interest" boundaries from the most recent version of the FWS_boundaries dataset.) – See R scripts above in step 2.b.

d. Import tables into <Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2b_WebObsSources\<LIT>_<Taxon>_ObservatrionsWeb.accdb.
    i. Name the tables Tbl_<LIT>_Spp<Taxon>_<Source>
e. Check the tables to be imported and make sure there is a "source" field or a field with the source that can be cross-walked to the standard "source" field.
f. Use Append query to compile the data into Tbl_Spp<Taxon>_ObservationsWeb (Web List) *Note incoming species names from the AKN/BISON datasets will be cross-walked to the standard field names during the append query.*

5. Once the <WebList> has been compiled from all sources, repeat ITIS standardization process discussed in the Step 2a "Integrated Taxonomic Information System (ITIS) Name Standardization section

Step 2c: Compiling observation data from hardcopy/digital files

Working directory for this step is:
<Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2c_HardcopyObs.

The refuge is likely to have many hardcopy and digital files with species observation data. Other sources of hardcopy and digital files with species observation data include published scientific papers, online gray literature (e.g., Google Scholar) and libraries (e.g., University of California system, California State University system, University of Nevada, California Academy of Sciences, etc.*). This step should only be completed if the Refuge staff can help compile the data and if the online sources did not produce many records.*

1. Search ServCat for digital files with species observation data that cover the NRMP project scope; download the PDF files into the references folder.
2. Identify additional hardcopy and digital files with species observation data relevant to the NRMP project scope that are not yet in ServCat by consulting refuge staff and searching the internet. Copy the PDF files of these plans into the <Project>Step2_SpeciesListDev\Step2c_HardcopyObs\HardcopyObsDocuments folder.
3. Enter the files from the task above into ServCat (note: entering documents into ServCat requires training by a regional I&M data manager).
4. Obtain the bibliographic data from ServCat for the files identified above and import into Mendeley or other reference management program (e.g., EndNote, RefWorks). See "Step 1a: Review and catalog existing conservation and invasive species plans for species, communities and ecosystems" for instructions on importing references into Mendeley.
5. Keep ServCat and Mendeley updated as new files with species observation data are identified during the development of the NRMP. It is recommended that one staff member involved in the NRMP process be tasked with keeping ServCat and Mendeley up to date. A copy of the most recent Mendeley file should be kept here: <Project>/references.

Hardcopy and digital files will either be tables of observations or single observations. The workflow is dependent on the type of incoming data (table vs single observation).

1. Single species observation data in hardcopy or digital files
    a. Copy Template_Spp_Observations.accdb from the <Project>\Data\ROC_Development\Step2_SpeciesListDev.folder and paste it in the Step2c_HardcopyObs folder.
        i. Name it **<LIT>_<Taxon>_ObservationsHC.accdb**
        ii. This is the Hardcopy Observations database
    b. Open <LIT>_<Taxon>_ObservationsHC.accdb. Rename Tbl_Spp_Observation table to **Tbl_Spp<Taxon>_ObservationsHC**
        i. This is the **Hardcopy List <HClist>**
    c. Add single species observation records to Tbl_Spp<Taxon>_ObservationsHC table.
2. Multiple species observation tables in hardcopy or digital files.
    a. Copy Tbl_Spp_Observations_Template.xlsx from the <Project>\Data\ROC_TableDevelopment\Step2_SpeciesListDev folder to the Step2c_HardcopyObs folder.
        i. Name it <LIT>_<Taxon>_ObservationsHC.xlsx
    b. Use ABBYY FineReader to extract species/community/ecosystem occurrence data from the documents that were identified in Step 2c, and populate <LIT>_<Taxon>_ObservationsHC.xlsx.
        i. For detailed instructions on extracting data using ABBYY FineReader, see "Step 1b: Extract tables from conservation and invasive species plans and standardize the extracted tables."

Data and tables from digital files (Word or Excel) can be processed without the use of ABBYY (although some Word files will be easier to use if transformed into tables in ABBYY). Paste the information into <LIT>_<Taxon>_ObservationsHC.xlsx.

    c. **Populate the "Source_Reference" column for each document that is added to the <LIT>_<Taxon>_ObservationsHC.xlsx file**. **Very Important**.

Once the data is in <LIT>_<Taxon>_ObservationsHC.xlsx, standardize the fields according to the Appendix 1: Appendix 1:

    d. Data Dictionary Table 1.
        i. See "Step 1b: Extract tables from conservation and invasive species plans and standardize the extracted tables" for detailed instructions on standardizing extracted tables.
    e. Import <LIT>_<Taxon>_ObservationsHC.xlsx into the <LIT>_<Taxon>_ObservationsHC.accdb database.
        i. Tbl_<LIT>_<Taxon>_HC_Excel.

f. Append the Tbl_<LIT>_<Taxon>_HC_Excel records into the Tbl_Spp<Taxon>_ObservationsHC table (Hardcopy List).

3. Repeat ITIS standardization process described in Step 2a: Integrated Taxonomic Information System (ITIS) Name Standardization

Step 2d: Create Documented Species List

Working directory for the Step:

<Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2d_DocumentedList

1. Copy the individual taxon species list or compiled refuge species databases from the **Step2a_ExistingLists\<Lit>SpeciesLists.accdb** or <LIT><Taxon>_List.accdb into the **Step2d_DocumentedList** folder:
    - To create the Documented Species List database (<LIT>_<Taxon>_List.accdb or **\<Lit>SpeciesLists.accdb**)
2. Import the observation data tables from databases in the **Step2b_WebObsSources** and the **Step2c_HardcopyObs** folders the documented species lists database : database (<LIT>_<Taxon>_List.accdb or **\<Lit>SpeciesLists.accdb**)

3. In each taxon database join the Tbl_<Taxon>_Spp_<LIT> table with the observation table using ScientificNameROC
    a. Update the Evidence field with information about the source of the observation (AKN,BISON etc.)
    b. Update the ObservationDate with the most recent observation date.
4. Create an Documented Species List Access database in: <Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2d_DocumentedList\<LIT> **Species_Lists_Documented.accdb.** *Note if you have been working with a single database for all Taxon you have already completed this step.*
5. Import each documented taxon list from the individual taxon databases
6. Run Append Query to combine the individual Tbl_<Taxon>_Spp_<LIT> tables into a single Tbl_<LIT>_SpeciesList table
7. Fill out Metadata Table as tables are imported and combined

Step 3: Create the Comprehensive ROC Table

a. Copy ROC_<LIT>.accdb from <Project>\Data\ROC_Development\Step1_PlanReview\Step3_Access to <Project>\Data\ROC_Development\Step3_ROC_Table
b. Import <LIT>_Tbl_Spp List from <Project>\Data\ROC_Development\Step2_SpeciesListDev\Step2d_DocumentedList\<LIT>Species_Lists_Documented.accdb

c. Assign ROC Values *NOTE: This step is only needed if ROCScores change from refuge to refuge, otherwise it is only need for new conservation tables added to the database.*
    a. Open <Planabbr>_<fieldname>_LUT for each plan. Add a ROC_Score field to each LUT. Assign the ROC Values
    b. Run an Update query to update the ROC_Score field in the plan table. – save each query with the Q_<tablename>ROC_Score
    c. For plans where all of the records have the same ROC_Score. Update the ROCScore field directly in the plan table.
d. Check the _process and _value tables are blank. If they are not empty delete the contents.
e. Run the modCompileData script Part 1 to populate the _process table
        a. Open _process. Delete the _process table and _value table from the _process table and delete any ~tmp records.
    f. Run the modCompileData script Part 2 to populate the _values table
    g. Run a Make Table query to get unique table names. Name the resulting table Table_Type. Add an autonumber ID field and a TableType field.
        a. Run a query to populate the TableType field from the Table_Type2 field. Fill out the table type for any new tables and select the tables you want to be in the final ROC table. Tables you will include should be labeled "data", tables to leave off are "data2" or lut.
        b. Delete Table_Type2 and rename the new Table_Type to Table_Type2
    h. Run Q_Cross_Tab2
    i. Run Q_ROC_Table_All – output is ROC_Table_All
    j. Run Q_ROC_Cross_Tab
    k. Q_ROC_Cross_Tab_List2 – Output is ROC_Table_<LIT>_List
        a. You will need to update the Output table name
        b. Update the Criteria to select the Species List table to restrict the resulting table to the refuge species list.
        c. Select all of the fields you want included. The fields in the Q_ROC_Cross_Tab_List2 represent what was used in the last refuge query.
    l. Add fields to ROC_Table_<LIT>_List
        a. Add ID – Autonumber, PlanScore 1 (number), PlanScore2(number), PlanScoreTotal(number), T_E_Score(number), Invasives_Score(number)
        b. Change all of the ROCScore values to "number"
    m. Run Q_PlanScore1- Make updates to the SQL query statement for the current ROC_Table_<LIT>_List name and the correct plans. The following is an example of the SQL code.
        a. Nz([ROC_Table_HMB_List]![Tbl_ABC_ConservationList_2013])+Nz([ROC_Table_HMB_List]![Tbl_AudubonStrategicPlan_2012])+Nz([ROC_Table_HMB_List]![Tbl_BatConsIntl_StrategicPlan_2013_AppendixA])+Nz([ROC_Table_HMB_List]![Tbl_CDFW_BSSC_2008_Table1_BirdSppOfSpecCon])+Nz([ROC_Table_HMB_List]![

Tbl_GrasslandBirdPlan_Table1-1])+Nz([ROC_Table_HMB_List]![Tbl_HumboldtMWD_HCP_2004_Table3])+Nz([ROC_Table_HMB_List]![Tbl_NABCI_StateOfTheBirds_CommonBirdsInSteepDecline_2014])+Nz([ROC_Table_HMB_List]![Tbl_NABCI_StateOfTheBirds_Watchlist_2014])+Nz([ROC_Table_HMB_List]![Tbl_NAWaterbirdCP_2002_App1ColonialBreeders])+Nz([ROC_Table_HMB_List]![Tbl_NAWaterbirdCP_2006_App1SolitaryCasualUpdate])+Nz([ROC_Table_HMB_List]![Tbl_NoAmerWaterfowlMgmtPlan_AllTables])+Nz([ROC_Table_HMB_List]![Tbl_PALCO_Humboldt_HCP_1999_Table2])+Nz([ROC_Table_HMB_List]![Tbl_PIF_LandbirdConsPlanPart1_2004_Table1])+Nz([ROC_Table_HMB_List]![Tbl_PIF2010_TriNational_AppendixB_C])+Nz([ROC_Table_HMB_List]![Tbl_Ripgot anBirdPlan_Ch5])

b. One method to update the SQL code is to copy it to a word document and use Search and Replace to change the table references in the code.

c. NOTE: "NZ" allows <null> values to be calculated as 0.

a. Run Q__PlanScore2

b. Nz([ROC_Table_HMB_List]![Tbl_SeabirdConservationPlan_Table2])+Nz([ROC_Table_HMB_List]![Tbl_SoPacShorebirdCP_2003_Table1])+Nz([ROC_Table_HMB_List]![Tbl_SpeciesSpecificPlans])+Nz([ROC_Table_HMB_List]![Tbl_Strategic_Plan_CAL_PCJV_2004_Table2])+Nz([ROC_Table_HMB_List]![Tbl_USFWS_BirdConservationConcern_2008])+Nz([ROC_Table_HMB_List]![Tbl_USFWS_BirdsOfManagementConcern_2011])+Nz([ROC_Table_HMB_List]![Tbl_USFWS_FocalSpecies_2012])+Nz([ROC_Table_HMB_List]![Tbl_USFWS_ShorebirdsBySeason2014_BCR5])+Nz([ROC_Table_HMB_List]![Tbl_XercesRedlist_AllLists])

a. The PlanScores were calculated in two steps because of an SQL length limit(*this could be developed as a VBscript)*

c. Run Q_PlanScoreTotal

a. Nz([ROC_Table_HMB_List]![PlanScore1])+Nz([ROC_Table_HMB_List]![PlanScore2])

d. Run Q_ROC_T_E

e. First is Update from Tbl_ESAspecies

f. Second is update from [ROC_Table_HMB_List]![Tbl_CDFW_CNDDBFeb2015_SEL_AllPlants] criteria = Is Null

g. Third: [ROC_Table_HMB_List]![Tbl_CDFW_CNDDBFeb2015_SEL_CATEAnimals] criteria = Is Null

h. Fourth: [ROC_Table_HMB_List]![Tbl_CDFW_CNDDBFeb2015_SEL_SSCFish] criteria = Is Null

i. Fifth: [ROC_Table_HMB_List]![Tbl_CDFW_CNDDBFeb2015_SEL_SSCMammals] criteria = Is Null

j. Sixth: [ROC_Table_HMB_List]![Tbl_CDFW_SSCHerps_Feb2015] criteria = Is Null

k. Run Q_ROC_Invasives:

l. First Update from [ROC_Table_HMB_List]![Tbl_CalIPC_WeedInventory]

m. Second: [ROC_Table_HMB_List]![Tbl_CAStateNoxiousWeedList_USDA] criteria = Is Null

n. Third: [ROC_Table_HMB_List]![Tbl_NWInvasiveWeedStrategicPlan_2013_TableI_II] criteria = Is Null

o. Once all of the scores queries have been run. The table can be cut and pasted into a google spreadsheet. Additional "criteria" for ranking the ROC's can be added to the google sheet.

Appendix 1:

Data Dictionary

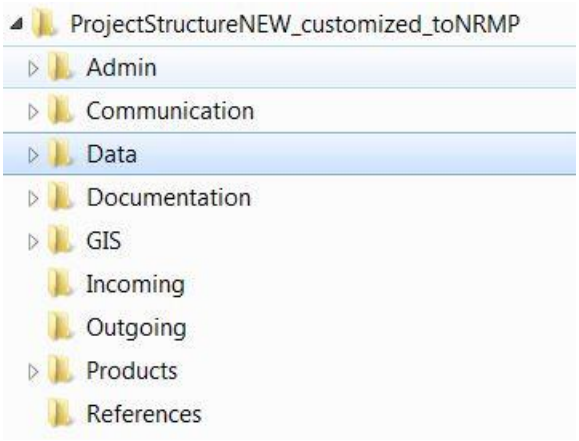
Table 1: Standard fields to add to plan tables

Field_Name	Description
Group	Species Taxon Group - plant, mammal, bird, herps, fish, inverts
CommonNameVerbatim	This is the common name exactly how it appears in the document
ScientificNameVerbatim	This is the scientific name exactly how it appears in the document
CommonNameVerbatimClean	This is the common name from the document cleaned of spelling errors and extra notation
ScientificNameVerbatimClean	This is the scientific name from the document cleaned of spelling errors and extra notation
GenusSpeciesVerbatim	This is the clean genus species from the document (if there is a subspecies in the original information, just have genus and species in this field)
GenusSpeciesSppVerbatim	This is the clean genus, species, subspecies from the document (if there is no subspecies in the original document just leave this field empty)
CommonNameITIS	Common Name standardized to ITIS - frequently ITIS does not have common names for subspecies. This is left blank in that case
ScientificNameITIS	Scientific Name standardized to ITIS - this is the full genus, species and subspecies if it was in the original document
GenusSpeciesITIS	Genus and Species standardized to ITIS (if there is a subspecies in the original information, just have genus and species in this field)
GenusSpeciesSppITIS	Genus, Species and Subspecies standardized to ITIS (if there is no subspecies in the original document just leave this field empty)
ScientificNameROC	ScientificNameITIS and ScientificNameVerbatim for names not in ITIS. This field allows names currently not in IT IS to be matched if they occur in any of the lists.
CommonNameROC	CommonNameITIS and CommonNameVerbatim for names not in I IS. This can help with the final ROC table and working with people more comfortable with common names.
TSN	ITIS Taxonomic Number

Author	Species Author
ITISNotes	Indication if the name is not in ITIS and when the search was made
Source_Reference	Reference for the source of the table content ie Nevada Wildlife Action Plan, 2012
Source_Table	Name of the table from the source ie Table 1.1 Species of Special Concern
ROCScore	The ROC Score value that will be updated for each priority.

NRMP Folder Structure

The top level of the standard NRMP folder structure is:



The “data” folder and the ROC_TableDevelopment folder structure is:

Appendix B. Data dictionary for Comprehensive ROC Database Tables

Field_Name	Description
CommonNameOriginal	This is the common name of a species, community or ecosystem exactly how it appears in the source document or database
ScientificNameOriginal	This is the scientific name of a species exactly how it appears in the source document or database
ResourceType	This is the type of resource ("species," "community" or "ecosystem"). "Species" includes subspecies, race, etc. A "community" is an interacting group of various species in a common location. An "ecosystem" is a community of living organisms (e.g., plants, animals and microbes) in conjunction with the nonliving components of their environment (e.g., water soils).
SourceShort	Provide the source organization/author_year. Use acronyms for organization. If multiple documents from the same organization or author come from the same year, follow each unique source with a letter (a, b, c, etc.). For example, BISON_2013 or Brown_1997a.
SourceFull	Provide the full citation of the source, including author/organization, year, title, journal, website, etc.
CommonNameOriginalClean	This is the common name from the document cleaned of spelling errors and extra notation
ScientificNameOriginalClean	This is the scientific name from the document cleaned of spelling errors and extra notation
GenusSpeciesClean	This is the clean genus species from the document (if there is a subspecies in the original information, just have genus and species in this field)
GenusSpeciesSspClean	This is the clean genus, species, subspecies from the document (if there is no subspecies in the original document just leave this field empty)
CommonNameITIS	Common Name standardized to ITIS - frequently ITIS does not have common names for subspecies. This is left blank in that case
ScientificNameITIS	Scientific Name standardized to ITIS - this is the full genus, species and subspecies if it was in the original document
GenusSpeciesITIS	Genus and Species standardized to ITIS (if there is a subspecies in the original information, just have genus and species in this field)
GenusSpeciesSspITIS	Genus, Species and Subspecies standardized to ITIS (if there is no subspecies in the original document just leave this field empty)

Appendix C. Criteria for filtering and rating Resources of Concern (ROCs)

Name	Description	Rating Scale
Invasive species status	Is the species classified as an Invasive Species: Executive Order 13112 Section 1. Definitions. (f) "Invasive species" means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Executive Order 13112 of February 3, 1999 - Invasive Species Federal Register: Feb 8, 1999 (Volume 64, Number 25)	Y = Yes, Then remove the species from the list for any further consideration as a ROC: N= No, the species remains on list for further consideration as a ROC
Contribution of the refuge (rapid method)	How important is the refuge globally, at the Flyway scale, regionally and locally for the species, community or ecosystem?	Globally/continentally significant (3) = >10% of the global/continental population of the species depends on the refuge for one or more stages of its lifecycle OR >10% of the global area of the community/ecosystem occurs on the refuge. Nationally significant (2) = If the above doesn't apply, >10% of the national population of the species depends on the refuge for one or more stages of its lifecycle OR >10% of the national area of the community/ecosystem occurs on the refuge. Regionally significant (defined by refuge) (1) = If the above doesn't apply, >10% of the regional population of the species depends on the refuge for one or more stages of its lifecycle OR >10% of the regional area of the ecosystem/ community occurs on the refuge. Not significant (0) = If the above doesn't apply, <10% of the regional population of the species depends on the refuge for one or more stages of its lifecycle OR <10% of the regional area of the ecosystem/ community occurs on the refuge.
Contribution of the refuge (extended method--optional)	How important is the refuge globally, at the Flyway scale, regionally and locally for the species, community or ecosystem?	Global significance (weight of 4) = % of the global population of the species that uses the refuge (including lands approved for acquisition) for one or more stages of its lifecycle OR % of the global area of the community/ecosystem that occurs on the refuge (including lands approved for acquisition) or could occur with restoration to historical conditions. Pacific Flyway significance (weight of 3) = % of the Pacific Flyway population of the species that uses the refuge (including lands approved for acquisition) for one or more stages of its lifecycle OR % of the Pacific Flyway area of the community/ecosystem that occurs on the refuge (including lands approved for acquisition) or could occur with restoration to historical conditions. Regional significance (defined by refuge) (weight of 2) = % of the regional population of the species that uses the refuge (including lands approved for acquisition) for one or more stages of its lifecycle OR % of the regional area of the ecosystem/ community that occurs on the refuge (including lands approved for acquisition) or could occur with restoration to historical conditions. Local significance (defined by refuge) (weight of 1) = % of the local population of the species that uses the refuge (including lands approved for acquisition) for one or more stages of its lifecycle OR

Name	Description	Rating Scale
		% of the local area of the ecosystem/ community that occurs on the refuge (including lands approved for acquisition) or could occur with restoration to historical conditions. The final score is a weighted average across all four spatial scales rescaled to span from 0-3 to match the range of the other criteria.
Tribal importance	Is the species, community or ecosystem identified by Native Americans as culturally important?	High (3) = The species, community or ecosystem has been specifically identified as having importance or significance to at least one local Native American entity. Medium (1.5) = The species, community or ecosystem has been identified as part of a group of resources (e.g., native wildlife) that have importance or significance to at least local Native American entities. Low (0) = The species, community or ecosystem has not been identified as having importance or significance to any local Native American entities.
Contribution to refuge purpose	Is the species, community or ecosystem identified in the Refuge purpose and/or enabling legislation?	Resource specifically mentioned (3) = The species, community or ecosystem is specifically mentioned in the refuge purpose or enabling legislation (e.g., Pacific black brant, eelgrass) Resource part of a fairly specific group (2) = The species, community or ecosystem is part of a fairly specific group mentioned in the refuge purpose or enabling legislation (e.g., colonial waterbirds, raptors, threatened or endangered species, or native grasslands). Resource part of a general group (1) = The species, community or ecosystem is part of a general group mentioned in the refuge purpose or enabling legislation (e.g., migratory birds, wildlife, wetlands). Resource not mentioned (0) = The species, community or ecosystem is not specifically mentioned or covered in any groups in the refuge purpose.
Site capabilities	Does the refuge have the capability (currently or through restoration) to provide the components necessary for the needs of the species, community or ecosystem (e.g., foraging areas for wintering waterfowl or suitable soil types for native grasslands etc.)?	High (3) = Refuge has the environmental conditions necessary to support the desired amount of the species, community or ecosystem. Medium (2) = Refuge has the environmental conditions necessary to support a portion of the desired amount of the species, community or ecosystem, and additional site capability CAN be feasibly created via restoration. Low (1) = Refuge has the environmental conditions necessary to support a portion of the desired amount of the species, community or ecosystem, but additional site capability CANNOT be feasibly created via restoration. None (0) = Site capability does not exist. The refuge does not have the environmental conditions necessary to support the species, community or ecosystem.

Name	Description	Rating Scale
Best science and professional judgment	How does the species, community or ecosystem rank on conservation priority (excludes federal and state plans)?	For Birds (the cut points will need to be adjusted for each NRMP): High (3) = The species appears on >10 lists as a conservation priority. Medium (2) = The species appears on 5-10 lists as a conservation priority. Low (1) = The species appears on 1-4 lists as a conservation priority. Not Applicable (0) = The species appears on 0 lists as a conservation priority. For all other ROCs (the cut points will need to be adjusted for each NRMP): High (3) = The species/community/ecosystem appears on 3 or more lists as a conservation priority. Medium (2) = The species/community/ecosystem appears on 2 lists as a conservation priority. Low (1) = The species/community/ecosystem appears on 1 list as a conservation priority. Not Applicable (0) = The species appears on 0 lists as a conservation priority.
Listing status or designation	Is the species, community or ecosystem federally listed, state listed, identified as a trust resource, or have other national /regional /local status or designation?	High (3) = The species is federally listed as T or E or is a Federal Candidate, or the community or ecosystem supports a federal T, E or Candidate species Moderate (2) = The species is state listed as T or E, or is a Federal trust resource of the NWRS (migratory bird, marine mammal or anadromous or interjurisdictional fish), or the community or ecosystem supports a state-listed T or E species or Federal trust resource Low (1) = The species is a State Candidate, or the community or ecosystem supports a State Candidate Not Applicable (0) = The species, community or ecosystem has no special listing status or designation.
Ecological relationships	How well does the species, community or ecosystem represent key ecological conditions and processes on the refuge and surrounding landscape, or how well does the species, community or ecosystem act as a direct indicator of ecosystem health on the refuge and surrounding landscape and/or represent biological integrity, diversity, and environmental health (BIDEH)?	High (3) = The species, community or ecosystem represents a key ecological condition or ecosystem process and/or acts as a direct indicator of the ecosystem's health on the refuge and surrounding landscape and is very important for maintaining BIDEH. Medium (1.5) = The species, community or ecosystem represents a key ecological condition or ecosystem process and/or acts as a direct indicator of the ecosystem's health on the refuge only and is likely to be important for maintaining BIDEH. Not applicable (0) = The species, community or ecosystem does not represent any key ecological conditions or ecosystem processes within the refuge and /or does not act as a direct indicator of the ecosystem's health within the refuge and surrounding landscape and is not important for maintaining BIDEH.

Name	**Description**	**Rating Scale**
Benefit to people	How much does the species, community or ecosystem benefit people? For example, pintail can be hunted, salt marshes provide flood protection, etc.	High (3) = The species, community or ecosystem provides up to 5 Big Six priority recreational uses for refuge visitors AND important economic benefits and/or ecosystem services that benefit people at the regional scale (e.g., flood protection, water filtration). Medium (2) = The species, community or ecosystem provides 5 of the Big Six priority recreational uses for refuge visitors. Low (1) = The species, community or ecosystem provides up to 4 of the Big Six priority recreational uses for refuge visitors. Not significant (0) = The species, community or ecosystem does not provide regionally unique or significant recreational opportunities, economic benefits, or ecosystem services.

Appendix D. How to install and use Mendeley

How to create a Mendeley account and install Desktop Mendeley

- Go to http://www.mendeley.com/
- Enter First Name, Last Name and Email address
- Click green button labeled "Sign up & Download"
- Have IT install the desktop software

How to import references to Mendeley from other bibliographic software (RefWorks, EndNote, etc.)

- Log into your account in RefWorks/EndNote/etc.
- Go to References menu. Choose Export.
- Select Bibliographic Software as the export format and export all your references.
- Alternatively you can export in BibTeX format.
- Open Mendeley Desktop
- Go to File > Add Files... and select the file you exported from RefWorks/EndNote/etc.
- Mendeley should import all the references automatically.

How to import a reference from a web search (e.g., Web of Science) to Mendeley

- Go to http://www.mendeley.com/import/
- Follow the directions to copy the "Save to Mendeley" bookmark into your browser
- Find an article online
- When you are viewing the details of the article in your web browser, click the "Save to Mendeley" bookmark
- Review the reference details and save

How to import a reference from a pdf

- Open Mendeley Desktop
- Drag and drop the pdf into the main field (make sure the pdf has OCR, or Optical Character Recognition; if not, you can OCR it in Adobe Acrobat Pro or you will have to type in all of the bibliographic information)
- Mendeley will try to automatically extract the author, year, title, etc. from the pdf; this information will be displayed on the right of your screen under the Details tab
- Check to make sure the details are correct; you may have to make some edits
- You can click the "Search by Title" button to try to correct some of the details (Mendeley will search google scholar and other online databases and fill in missing information automatically)
- Click on the pdf icon of the new record to view the pdf

How to cite while you write and create a bibliography in Microsoft Word

- To install the Mendeley Plugin you need to first close Word and then on Mendeley Desktop go to Tools > Install <Your text processor> Plugin. If after installing the Mendeley Plugin you are unable to find the toolbar, please try the following:
    1. On your text processor, go to View > Toolbars and select the Mendeley toolbar. You should then be able to see the buttons 'Insert Citation', 'Insert Bibliography', etc. In Word 2007 and 2010, you will find the Mendeley plugin in Word's References ribbon.
    2. Try and insert a citation by clicking on 'Insert Citation' and a dialog window will appear. You can either type in the title of the reference you wish to insert, or click Go To Mendeley, and then selecting the relevant reference in your Mendeley Desktop.
    3. If you click Go To Mendeley, the 'Send Citation to Word' button will appear on Mendeley Desktop. Click on it to send the citation to your Word document.
    4. When you are ready to insert the Bibliography, simply click on the 'Insert Bibliography' button.
- Video here: http://support.mendeley.com/customer/portal/articles/168756-installing-and-using-the-word-plugin-in-windows

How to sync Mendeley Desktop with Mendeley Web

- In Mendeley Desktop, hit the “Sync” button at the top of the screen

How to change settings for synchronizing bibliographic information and/or pdf’s between Mendeley Destop and Mendeley Web

- In Mendeley Destop, click the “Edit Settings” button at the top of the screen.

For more information, check out the Mendeley support page here:

http://support.mendeley.com/